Naval Research Laboratory

Washington, DC 20375-5320

NRL/FR/6364--11-10,213

Prioritization of the Percutaneous Hazard of Industrial Chemicals

THOMAS E. SUTTO

Materials and Sensors Branch
Materials Science and Technology Division

October 28, 2011

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	**2. REPORT TYPE**	**3. DATES COVERED** *(From - To)*
28-10-2011	Formal Report	

4. TITLE AND SUBTITLE

Prioritization of the Percutaneous Hazard of Industrial Chemicals

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

Thomas E. Sutto

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Naval Research Laboratory
Materials Science and Technology Divison, Code 6364
4555 Overlook Avenue, SW
Washington, DC 20375-5320

8. PERFORMING ORGANIZATION REPORT NUMBER

NRL/FR/6364--11-10,213

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Joint Project Manager for Protection
Joint Project Manager – Protection
50 Tech Parkway, Suite 301
Stafford, VA 22556

10. SPONSOR / MONITOR'S ACRONYM(S)

JPM-P

11. SPONSOR / MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT

This report has been prepared for the Joint Project Manager for Protection (JPM-P) to document the prioritization of the potential percutaneous hazard of industrial chemicals.

15. SUBJECT TERMS

Toxic industrial chemicals
Percutaneous
Prioritization

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
					Thomas E. Sutto
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**	UU	42	**19b. TELEPHONE NUMBER** *(include area code)*
Unclassified	Unclassified	Unclassified			202-404-2097

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39.18

This page intentionally left blank

CONTENTS

FIGURES

TABLES

ACRONYMS AND ABBREVIATIONS

C	Degrees Centigrade
CAMEO	Computer-Aided Management of Emergency Operations (EPA and NOAA computer program available online)
CAS	Chemical Abstracts Service
CFR	Code of Federal Regulations
CHPPM	(U.S. Army) Center for Health Promotion and Preventative Medicine
DHS	Department of Homeland Security
DWCP	Directory of World Chemical Producers
EPA	Environmental Protection Agency
F	Degrees Fahrenheit
ICA	Industrial Chemical Assessment
ITF	International Task Force
JPEO-CBD	Joint Program Executive Office for Chemical and Biological Defense Programs
JPM-IP	Joint Project Manager for Individual Protection
JPM-P	Joint Project Manager for Protection (New identity of JPM-IP)
L	Liters
LD	Lethal Dose
LDLo	Lethal Dose Low: the lowest dose causing lethality
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NOAA	National Oceanic and Atmospheric Administration
NRL	Naval Research Laboratory
OMPA	Octamethyl diphosphoramide
R&D	Research and Development
RTECS	Registry of Toxic Effects of Chemical Substances
T&E	Test and Evaluation
TIC	Toxic Industrial Chemical

EXECUTIVE SUMMARY

This report has been prepared for the Joint Project Manager for Protection (JPM-P) of the Joint Program Executive Office for Chemical and Biological Defense Programs (JPEO-CBD) to document the risk management strategy adopted to prioritize and assess the potential percutaneous hazard of industrial chemicals to the warfighter.

The Naval Research Laboratory (NRL) developed this prioritization using the scoring algorithm they derived and tested and the Industrial Chemical Assessment (ICA) database they created in 2008 (published in 2010). For the present study, NRL assessed 333 of the chemicals in the original NRL ICA database — those for which percutaneous toxicity data is available — and also expanded this primary list of chemicals to include those in the Department of Homeland Security's "Chemicals of Interest" list (6 CFR 27, Appendix to Part 27). This added 221 more chemicals to the original list of 333. However, percutaneous toxicity data could be found for only 62 of the additional chemicals, bringing the total number of chemicals in the Percutaneous Toxicity portion of the updated database to 395. The database containing the chemical and scoring data used to assess the percutaneous hazard is detailed in this report's Appendix.

Many of the chemicals newly added to the database are fuels and explosives, which score low due to their reactivity, or specialty chemicals, which score low due to their low relative probability score. Compared to the previous (2010) analysis, the Critical Hazard Chemical List grew from 26 chemicals to 28 chemicals. However, after further downselection through class-based and reactivity analyses, the final High Priority Hazard List did not change from that in the previous analysis.

Table E1 shows, in alphabetical order, the six high priority percutaneous hazard chemicals. It is important to note that this is not a threat list. These chemicals have been selected, through the prioritization process, as representative chemicals for research, development, test, and evaluation since it not possible to test against all of the thousands of potentially hazardous industrial chemicals. Crucial to this prioritization is NRL's development and implementation of a class-based analysis to ensure that the threat of industrial chemicals is comprehensively assessed. Follow-on test and evaluation will be used to evaluate this list to confirm the validity of the class-based analysis used in the assessment and, if possible, further downselect these chemicals.

This study focuses on the percutaneous military hazard of industrial chemicals. This effort also lays out a common approach for assessment of other hazards such as inhalation and ocular, oral, explosive, and radiological military hazards, which will be documented in follow-on reports.

Table E1 — High Priority Percutaneous Hazard Chemicals

Chemical	CAS Number
Ammonia (as ammonium hydroxide) SUB LDLo R	7664-41-7
Ethylene dibromide	106-93-4
Formaldehyde (Formalin solution-37% methanol) R	50-00-0
Nitric acid TDLo	7697-37-2
OMPA	152-16-9
Sulfuric acid	7664-93-9

Oxidizer	Reducer	Volatile Organic	Pesticide/ Herbicide/Fungicide	Self-Polymerizer

PRIORITIZATION OF THE PERCUTANEOUS HAZARD OF INDUSTRIAL CHEMICALS

1 INTRODUCTION

This report has been prepared for the Joint Project Manager for Protection (JPM-P)[1] of the Joint Program Executive Office for Chemical and Biological Defense Programs (JPEO-CBD) to document the risk management strategy adopted to prioritize and assess the potential percutaneous hazard of industrial chemicals to the warfighter.

In 2008, the Naval Research Laboratory (NRL) was contracted by JPM-IP to analyze existing toxic industrial chemical (TIC) assessments, such as the International Task Force (ITF)-40 report,[2] and if necessary, co-develop an alternative approach to provide a comprehensive list of TICs that takes into account flammability, reactivity, and the different classes of chemicals in the world. The purpose was to develop a scientifically based prioritization of chemicals that selects a representative list of industrial chemicals for research and development (R&D) and test and evaluation (T&E) for chemical/biological defense systems.

NRL, in coordination with JPM-IP, compiled a database of 430 principal industrial chemicals and developed a scoring algorithm that allows for a documented, repeatable, systematic prioritization of these chemicals. This database and prioritization are called the NRL Industrial Chemical Assessment (NRL ICA).[3] As part of this prioritization, a class-based analysis was used as a key risk mitigation strategy. The class-based analysis, defined by strict chemical terms relating to the formation or breaking of a chemical bond, was used to group like chemicals into representative classes, mitigating the risk of encountering chemicals in the operational environment that have not been assessed.

For the present study of percutaneous hazards, 333 chemicals in the primary NRL ICA database were assessed, based on the availability of percutaneous toxicity data. In addition, the database was expanded to include the Department of Homeland Security's "Chemicals of Interest" list.[4] Percutaneous toxicity data could be found for only 62 of the 221 additional chemicals, bringing the total number of chemicals in the Percutaneous Toxicity portion of the updated database to 395 chemicals. This report documents the prioritization process using the updated list of chemicals. The chemical and scoring data are detailed in the Appendix.

---

[1] Formerly known as the Joint Project Manager for Individual Protection, JPM-IP.

[2] "Industrial Chemical Prioritization and Determination of Critical Hazards of Concern, Technical Annex and Supporting Documents for International Task Force (ITF)-40, Industrial Chemical Hazards: Medical and Operational Concerns," U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) Report 47-EM-6154-03, November 2003, Aberdeen Proving Ground, MD (FOUO).

[3] T.E. Sutto, "Toxic Industrial Chemicals: Global Assessment and Scientific Analysis," NRL/FR/6364--09-10,182, Naval Research Laboratory, Washington, DC, Feb. 2010.

[4] 6 CFR Part 27, Chemical Facility Antiterrorism Standards, Appendix A to Part 27, DHS Chemicals of Interest. Published in the Federal Register Vol. 72, No. 223, Nov. 20, 2007, Part II, Department of Homeland Security.

Manuscript approved August 22, 2011.

Many of the newly added chemicals are fuels and explosives, which score low due to their reactivity, or specialty chemicals, which score low due to their low relative probability score. Therefore, even with the additional 62 chemicals, the critical hazard chemical list (discussed in Section 2.2) has grown only from 26 chemicals to 28 chemicals compared to the list derived in the previous (2010) NRL assessment of TICs, and after class-based analysis and reactivity assessment, the final high priority list (discussed in Section 2.4) does not change from that derived in the 2010 analysis.

This study focusing on the percutaneous military hazard of industrial chemicals lays out a common approach for assessing other hazards such as inhalation and ocular, oral, explosive, and radiological military hazards. These will be documented in follow-on reports.

2 THE NRL ICA PRIORITIZATION PROCESS

The prioritization methodology developed in 2008 by NRL and JMP-IP includes criteria to account not only for toxicity but also for the environmental behavior of industrial chemicals. Previous efforts to assess the threat of industrial chemicals, such as the ITF-40 and its predecessor, the ITF-25, did not adequately discriminate between toxic threats and explosive/unstable hazards, so do not adequately describe industrial chemicals for the purposes of chemical/biological defense programs.

The NRL/JPM-IP prioritization approach consists of the following steps:

Step 1: Development of the NRL ICA database
Step 2: Generation of a Critical Hazard List
Step 3: Class-based analysis of prioritization results
Step 4: Downselection to a High Priority Hazard List

These steps are discussed in detail in the sections that follow. Figure 1 illustrates the overall process.

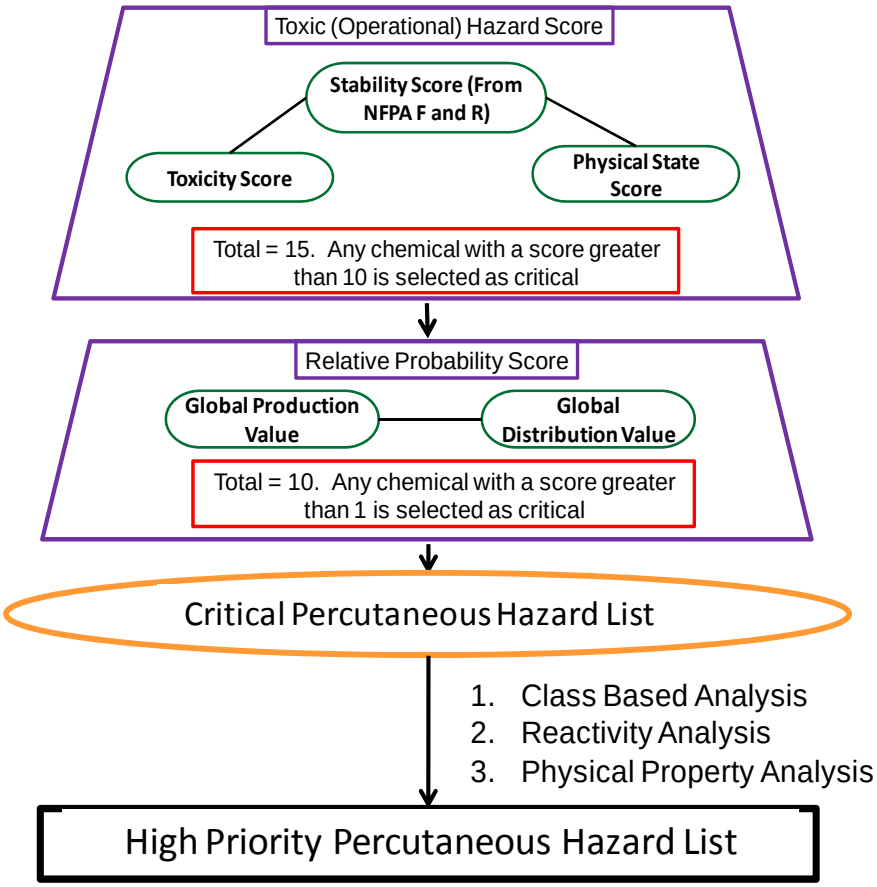


Fig. 1 — Flow chart of the NRL ICA prioritization process

2.1 Development of the Database

Because an analysis of the ITF-40 database revealed missing or incorrect data, the NRL ICA developed a new, comprehensive database, which for the percutaneous hazard assessment contains 395 chemicals. Included in the NRL-ICA database are the raw data required to perform the prioritization (see the Appendix). The primary chemical data sources are the U.S. Environmental Protection Agency (EPA)/National Oceanic and Atmospheric Administration (NOAA) Computer-Aided Management of Emergency Operations (CAMEO) program, version 1.2.2, and the Registry of Toxic Effects of Chemical Substances (RTECS) database (2009). When necessary, this data is augmented by the 2007 Merck Index and peer-reviewed scientific literature. Chemicals are scored/prioritized according to their toxicity, stability, physical state, and production and distribution characteristics.

2.1.1 Toxic (Operational) Hazard Score

Each chemical is given a score from 0 to 5 as a means of ranking its toxicity, stability, and physical state. These scores are then combined to generate the Toxic (Operational) Hazard Score, which ranges from 0 to 15.

2.1.1.1 Toxicity Score

The dermal toxicity of each chemical is based on dermal Lethal Dose (LD) 50 data in mg/kg from the RTECS database. Because much of the data available is for rats, this is selected as the primary animal data source. When rat data is not available, the selection protocol is the following: rabbit, then mouse, then guinea pig, then LD 50 subcutaneous, then LD 50 intraperitoneal, and then LDLo dermal. These toxicity values are plotted on a logarithmic scale and scores are assigned ranging from 0 to 5, where 5 is the most toxic. Table 1 shows the scoring criteria.

Table 1 — Dermal Toxicity Scoring

Toxicity Range (in mg/kg)	Toxicity Score
Dermal Toxicity $\leq$ 10	5
10 < Dermal Toxicity $\leq$ 100	4
100 < Dermal Toxicity $\leq$ 1000	3
1000 < Dermal Toxicity $\leq$ 10,000	2
10,000 < Dermal Toxicity $\leq$ 100,000	1
100,000 < Dermal Toxicity	0

One critical aspect not assessed by previous efforts to determine the percutaneous hazard of industrial chemicals is the ability of a chemical to cause dermal corrosion. Dermal corrosion is defined by the EPA as the ability of a chemical to rapidly cause second-degree burns. The Appendix lists and scores some of the most corrosive and commonly found chemicals. In the database, those chemicals deemed a corrosive hazard are not given a dermal toxicity score based on dermal LD 50 values, but are instead given a score based upon their ability to rapidly corrode skin. For clarity, these dermal corrosion scores are highlighted in pink in the database (see the Appendix). Table 2 details the scoring protocol for dermal corrosion.

Table 2 — Dermal Corrosion Scoring

Range (minutes)	Dermal Score
Corrodes skin $\leq$ 1	5
1 < Corrodes skin $\leq$ 10	4
10 < Corrodes skin $\leq$ 100	3
100 < Corrodes skin $\leq$ 1000	2
1000 < Corrodes skin	1

2.1.1.2 Stability Score

Chemical stability scoring is used to assess reactivity and flammability of a chemical. Highly reactive or flammable chemicals receive a low score. The basis for this scoring is that high reactivity and flammability pose less of a toxic hazard and more of an explosive hazard.

Reactivity is considered because an industrial chemical may react with the atmosphere or with water present in the atmosphere, and then either decompose, as in the case of diborane, or change to an alternate threat, as in the case of phosphoryl chloride, which generates an inhalation hazard of hydrogen chloride. Flammability is also considered since highly flammable chemicals represent more of an explosive hazard given the multiple ignition sources in the operational environment. An example of this is ethylene oxide, whose explosive potential has been used in the battlefield in the form of fuel air bombs.

The chemical stability score is calculated using the National Fire Protection Association (NFPA) reactivity (R) and flammability (F) values. The NFPA values of flammability and reactivity increase as the reactivity and flammability of a chemical increase; therefore, in the prioritization process, reactivity and flammability values are placed on an inverted scale to agree with the assessment that increased flammability and reactivity should decrease the toxic operational score of a chemical. Because toxicity is assessed on a 5-point scale, the NFPA values are also placed on a 5-point scale. This scoring protocol is shown in Table 3 and Table 4. The stability score of each TIC is calculated by averaging the flammability and reactivity scores.

Table 3 — Flammability Scoring

NFPA Flammability Value	Flammability Score→ (4−F)×1.25
0	5
1	3.75
2	2.50
3	1.25
4	0

Table 4 — Reactivity Scoring

NFPA Reactivity Value	Reactivity Score → (4−R)×1.25
0	5
1	3.75
2	2.50
3	1.25
4	0

2.1.1.3 Physical State Score

The parameter of physical state is used to assess the ability to disperse a chemical to create a percutaneous hazard. For this scoring, the physical state of a chemical is determined at ambient conditions (1 atm and 70 °F or 21 °C). See Table 5.

Table 5 — Physical State Scoring

Physical State	Physical State Score
Gas	5
Liquid	2.5
Solid	1

2.1.2 Relative Probability Score

One of the most problematic aspects of assessing the potential hazard of industrial chemicals in the operational environment lies in the great uncertainty surrounding the global chemical industry. Although there are several databases that allow an estimation of how much of a certain chemical is manufactured, these consist of only voluntarily submitted data with no follow-on inspections to verify the data. Since a detailed, thorough inspection of each chemical plant is not feasible, there remains a significant degree of uncertainty in determining the exact probability of encountering any one chemical. Therefore, a pseudo-probability function based on the production amount and distribution of a chemical is used to determine a total probability score. To represent global production amounts of a chemical, the total number of countries producing a chemical is used. To estimate the global distribution of a chemical, the total number of reported distribution sites for a chemical is used.

Here, data from the Directory of World Chemical Producers (DWCP) is used to determine both production and distribution scores. These two scores are then added to form the Relative Probability Score, which ranges from 0 to 10.

2.1.2.1 Global Production Score

The global production score is used to account for the bulk quantities of TICs being produced. The data regarding the number of countries involved in the production of a specific TIC is maintained in the DWCP and is used to assign a production score from 0 to 5, as shown in Table 6.

Table 6 — Global Production Scoring

Numbers of Producing Countries	Production Score
# of Countries ≥ 50	5
40 ≤ # of Countries < 50	4
30 ≤ # of Countries < 40	3
20 ≤ # of Countries < 30	2
# of Countries ≤ 20	1
# of Countries ≤ 10	0

2.1.2.2 Global Distribution Score

The global distribution score is based on the number of global production and distribution sites appearing in the DWCP. This approach ensures accountability for the higher availability of certain chemicals regardless of the quantity produced. The scoring criteria are shown in Table 7.

Table 7 — Global Distribution Scoring

Numbers of Sites Chemical is Available	Distribution Score
# of Sites ≥ 100	5
50 < # of Sites < 100	4
10 < # of Sites ≤ 50	3
5 < # of Sites ≤ 10	2
0 < # of Sites ≤ 5	1
# of Sites = 0	0

2.1.2.3 Threat Score

A separate threat score is developed to account for actual incident data or other threat information for particular TICs. This score is placed in the probability section of the database but is not used to determine the Relative Probability Score, due to the subjective nature of this data.

2.2 Generation of the Critical Percutaneous Hazard List

The next step in the prioritization approach is to use the previously described scores to generate a critical chemical list. Any chemical with a Toxic (Operational) Hazard Score greater than 10 and a Relative Probability Score greater than 1 is designated as critical. Table 8 shows the Critical Percutaneous Hazard Chemical List.

Table 8 — Critical Percutaneous Hazard List

Critical Percutaneous Hazard List						
Rank	Chemical and Toxicity Data Source	CAS Number	Toxic (Operational) Hazard Score	Probability Section		Total Score
				Relative Probability Score	Threat Scores	
1	Ammonia (as ammonium hydroxide) SUB LDLo R	7664-41-7	13.38	10.00	5.00	28.38
2	Hydrogen chloride IPR Mouse	7647-01-0	13.38	10.00	0.50	23.88
3	Formaldehyde (Formalin solution-37% methanol) R	50-00-0	11.75	10.00	0.50	22.25
4	Sulfuric acid	7664-93-9	10.25	10.00	2.50	22.75
5	Nitric acid TDLo	7697-37-2	12.50	9.00	0.50	22.00
6	Hydrogen fluoride LDLo M	7664-39-3	12.38	7.00	2.50	21.88
7	Hydrogen bromide IPR	10035-10-6	14.00	5.00	0.00	19.00
8	Tetrafluoroboric acid IPR	16872-11-0	11.88	5.00	0.50	17.38
9	Methyl bromide SUB	74-83-9	12.38	4.00	0.50	16.88
10	Boron trifluoride R and as 40% HF	7637-07-2	12.38	4.00	0.00	16.38
11	Fluorotrichloromethane IPR Mouse	75-69-4	12.00	4.00	0.00	16.00
12	Hydrogen sulfide IIPR M	7783-06-4	11.50	4.00	0.50	16.00
13	OMPA	152-16-9	11.50	4.00	0.50	16.00
14	Tetrachloroethylene SUB M	127-18-4	11.50	4.00	0.00	15.50
15	Potassium cyanide SUB R	151-50-8	11.00	4.00	2.50	17.50
16	Cadmium SUB	7440-43-9	11.00	4.00	0.50	15.50
17	Mercury Tdlo, H, SUB	7439-97-6	10.50	4.00	5.00	19.50
18	Deltamethrin MIN	52918-63-5	10.50	4.00	0.50	15.00
19	Ethylamine **	75-04-7	10.50	4.00	0.00	14.50
20	Methylamine GP LDLo	74-89-5	10.50	4.00	0.00	14.50
21	Hexafluoroacetone **	684-16-2	11.50	3.00	0.00	14.50
22	Phosphine TDLo IPR	7803-51-2	11.25	3.00	0.50	14.75
23	Parathion *	56-38-2	10.63	3.00	0.50	14.13
24	Ethylene dibromide	106-93-4	10.50	3.00	0.00	13.50
25	Trimethylamine-**	75-50-3	10.50	3.00	0.00	13.50
26	Dichloroethyl ether R	111-44-4	10.25	3.00	0.00	13.25
27	Nitrogen trifluoride IPR	7783-54-2	10.25	3.00	0.00	13.25
28	Aldicarb	116-06-3	11.00	2.00	0.50	13.50

Oxidizer	Reducer	Volatile Organic	Pesticide/ Herbicide/Fungicide	Self-Polymerizer

2.3 Class-based Analysis of the Critical Percutaneous Hazard List

The next step in the prioritization process is to group the critical chemicals into like classes, to be followed by a reactivity and physical state analysis to allow further downselection.

2.3.1 NRL Class-based Approach

To mitigate the uncertainty in the probability section of the database, a class-based analysis is used to group the chemicals in the critical list. Part of the downselection process is to then select the highest scoring chemical within each group or class. The purpose is to ensure that representatives of all of the main chemical classes are selected for the high priority list; although a chemical may score low due to a low Toxic (Operational) Hazard Score or low Probability Score, it will still be represented in the final list. The class-based analysis is crucial to ensure that the risk management aspects of the prioritization approach select a high priority list of chemicals that can be used to represent the vast diversity of chemicals found in the global chemical industry.

The class-based analysis developed by NRL is based on fundamental chemical reactivity principles. Since any chemical reaction is based upon the flow of electrons to form or break bonds, using terms based on the following definitions provides definitive, chemistry-based classes. The five principal classes of chemicals are described below.

- Oxidizers: An oxidizer is a chemical that readily accepts electrons in a chemical reaction. This class contains compounds typically considered as “acid-gas forming,” such as hydrogen chloride, and also chlorine, fluorine, hydrogen peroxide, and ozone.

- Reducers: This class of compounds consists of chemicals that readily donate electrons in a chemical reaction. This class includes the “hydride family,” such as ammonia, phosphine, and arsine, as well as hydrazines and amines. Additionally, compounds that fall into this class include many reactive metals, such as sodium, arsenic, thallium, and mercury.

- Volatile Organic Compounds: These are simple organic compounds addressed separately as specific types of both inhalation hazards and contact hazards (certain compounds of this class are strongly degrading to plastics and coatings). They are widely produced and used in the production industry and have a high vapor density. This class includes compounds such as methylene chloride, benzene, carbon disulfide, and carbon tetrachloride.

- “ANY”-icides: This class of compounds includes pesticides, herbicides, and poisons developed for various agricultural or industrial uses. Through decades of undocumented production and transport of these compounds, the hazard posed by these compounds globally is difficult to quantify. Many of them are among the most toxic compounds listed in the NIOSH Pocket Guide to Chemical Hazards, and they are stable and readily dispersed. Therefore, this class of compounds is addressed separately.

- Self-polymerizers: Polymerizable compounds are capable of undergoing self-reactions that release energy. Some polymerization reactions generate a great deal of heat. The products of polymerization reactions are generally less reactive than the starting materials. The reaction tendency of these compounds makes them behave differently in the environment and with other materials when compared to simple organic compounds such as carbon tetrachloride or carbon disulfide. Typically, these compounds are flammable and react with both oxidizers and reducers.

This class includes phosgene, cyanogen chloride, formaldehyde, acrylonitrile, and methyl isocyanate.

It should be noted that for the purposes of test and evaluation, other class-based approaches are possible.

2.4 Downselection to the High Priority Percutaneous Hazard List

Building on the class-based analysis, chemical and environmental reactivity and byproducts are next considered, to downselect to a high priority list of chemicals. Reactions and byproducts — especially of chemicals that readily react with air or water — might result in a reduced health hazard, a different type of hazard, or an additional hazard being present rather than that of the parent compound. Chemicals that undergo such a transformation should not be selected for the high priority list.

Through class-based analysis and reactivity assessment of the critical percutaneous hazard list, certain chemicals are selected or not selected as high priority percutaneous hazards for the reasons documented below. The chemical analysis is based upon the environmental fate data and references summarized in the Appendix.

For considering percutaneous hazard, neither gases nor solids are selected. The highest ranking chemical within each class is selected, with preference given to either chemicals that score high due to their dermal corrosion score or to chemicals with a documented dermal LD 50 value.

1. Ammonia is selected (as ammonium hydroxide) as the highest scoring representative of the reducer class. Although it does not have a dermal LD 50 value, its dermal corrosivity gives it a dermal corrosion score of 4 out of 5.

2. Boron trifluoride is not selected since in the operational environment, it rapidly decomposes to hydrogen fluoride, which is already selected for the oxidizer class.

3. Sulfuric acid, in liquid form, is selected as the representative percutaneous hazard for multiple species such as sulfur trioxide, a variety of oleum concentrations, and “fuming” sulfur acid. For all of these compounds, the percutaneous hazard in the operational environment is that of sulfuric acid. It has a dermal corrosion score of 4 out of 5.

4. Formaldehyde has a twofold nature. Although in pure form, it is a volatile gas, it is most commonly shipped in solution form at concentrations of up to 37% in a solution of 10% methanol and 90% water. As such, it represents an ocular and inhalation hazard as well as a potential percutaneous hazard.

5. For the oxidizers, nitric acid also scores highly due to its unique reactive nature. Nitric acid is known to react not only with carbon- and silicone-based materials, but also with many types of metals and coatings. It has a dermal corrosion score of 5 out of 5.

6. Since pesticides/herbicides and fungicides are generally dispersed using an organic solvent at concentrations between 1% and 5% and are generally shipped in organic solvents at concentrations of 50% (using various types of light petroleum distillates or other volatile organic solvents), testing and modeling is focused on using a 5% organic solution. OMPA, or octamethyl diphosphoramide, is the highest scoring pesticide and is selected to represent the percutaneous threat of this class.

7. Although tetrachloroethylene is the highest scoring representative of the volatile organic class, its toxicity scoring is based on subcutaneous dermal LD 50 data, so it is not selected. Instead, ethylene dibromide is selected to represent this class because it has dermal LD 50 data based on rabbit testing.

The expansion of the chemical database resulted in the addition of two chemicals to the critical percutaneous list, as compared to the 2010 analysis: trimethylamine and hexafluoroacetone. Trimethylamine is in the reducing class and is isostructural with ammonium hydroxide, which is already selected; therefore, this chemical is not added to the high priority list. Hexafluoroacetone is of the same class as ethylene dibromide (simple organic) and so is not selected because a representative of this class is already selected.

Table 9 lists the six high priority percutaneous hazard chemicals, chosen based on the above analyses. Note that scoring within this high priority list is not of primary importance, and the chemicals are simply listed in alphabetical order

Table 9 — High Priority Percutaneous Hazard List

Chemical	CAS Number
Ammonia (as ammonium hydroxide) SUB LDLo R	7664-41-7
Ethylene dibromide	106-93-4
Formaldehyde (Formalin solution-37% methanol) R	50-00-0
Nitric acid TDLo	7697-37-2
OMPA	152-16-9
Sulfuric acid	7664-93-9

Oxidizer	Reducer	Volatile Organic	Pesticide/ Herbicide/Fungicide	Self-Polymerizer

3 CONCLUSIONS

This report details the steps taken by NRL for JPM-P to develop a comprehensive, scientific prioritization of industrial chemicals that may pose percutaneous hazards. The main goal of this effort was to develop a high priority list of chemicals that comprehensively allows R&D and T&E to develop and test technologies for defensive purposes against industrial chemicals while significantly reducing the cost and burden of such activities.

NAVAL RESEARCH LABORATORY

NRL/FR/6364—11-10,213

PRIORITIZATION OF THE PERCUTANEOUS HAZARD OF INDUSTRIAL CHEMICALS

Thomas E. Sutto
Materials Science and Technology Division

APPENDIX
(distributed on CD-ROM only)

Percutaneous Hazard Database and Prioritization Results

Rank	Chemical and Toxicity Data Source Chemical Dermal Toxicity: LD50 Dermal Rat>Rabbit>Guinea Pig>Mouse>LD50 Subcutaneous>LD50 Intraperitoneal>LDLo Dermal Coding: M = mouse, R = rabbit, GP = guinea pig, MIN-LD value reported is the minimum, Intraperitoneal = IPR, Subcutaneous = SUB	CAS Number	Dermal Toxicity Value in mg/kg (for values reported in ul/kg, the values were converted to mg/kg based on the density of the chemical at STP)	Dermal Toxicity Score	Reactivity Number	Reactivity Score	Flammability Number	Flammability Score	Stability Score	Physical State
1	Ammonia (as ammonium hydroxide) SUB LDLo R	7664-41-7	200.00	4.00	0.00	5.00	1.00	3.75	4.38	5.00
2	Hydrogen chloride IPR Mouse	7647-01-0	40.10	4.00	1.00	3.75	0.00	5.00	4.38	5.00
3	Sulfuric acid	7664-93-9	x	4.00	2.00	2.50	0.00	5.00	3.75	2.50
4	Formaldehyde (Formalin solution-37% methanol) R	50-00-0	270.00	3.00	0.00	5.00	2.00	2.50	3.75	5.00
5	Nitric acid TDLo	7697-37-2	21600.00	5.00	0.00	5.00	0.00	5.00	5.00	2.50
6	Hydrogen fluoride LDLo M	7664-39-3	500.00	3.00	1.00	3.75	0.00	5.00	4.38	5.00
7	Mercury Tdlo, H, SUB	7439-97-6	254.00	3.00	0.00	5.00	0.00	5.00	5.00	2.50
8	Ammonium Chloride MIN	12125-02-9	5000.00	2.00	1.00	3.75	0.00	5.00	4.38	1.00
9	Hydrogen bromide IPR	10035-10-6	76.00	4.00	0.00	5.00	0.00	5.00	5.00	5.00
10	Sodium hydroxide IPR M	1310-73-2	40.00	3.00	1.00	3.75	0.00	5.00	4.38	1.00
11	Acetic acid	64-19-7	1060.00	3.00	0.00	5.00	2.00	2.50	3.75	2.50
12	Sodium cyanide R	143-33-9	10.40	4.00	0.00	5.00	0.00	5.00	5.00	1.00
13	Dibasic sodium phosphate IPR	10039-32-4	430.00	3.00	0.00	5.00	0.00	5.00	5.00	1.00
14	Ethyl alcohol IPR	64-17-5	3600.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
15	Phosphoric acid	7664-38-2	2740.00	3.00	0.00	5.00	0.00	5.00	5.00	1.00
16	Calcium Hydroxide R	1305-62-0	2520.00	2.00	1.00	3.75	0.00	5.00	4.38	1.00
17	Potassium cyanide SUB R	151-50-8	4.00	5.00	0.00	5.00	0.00	5.00	5.00	1.00
18	Tetrafluoroboric acid IPR	16872-11-0	10.00	5.00	1.00	3.75	0.00	5.00	4.38	2.50
19	1,3-Butadiene	106-99-0	669.00	3.00	2.00	2.50	4.00	0.00	1.25	5.00
20	Sodium Nitrate IPR	7631-99-4	181.00	3.00	2.00	2.50	0.00	5.00	3.75	1.00
21	Benzene R	71-43-2	9400.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
22	Toluene	108-88-3	8390.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
23	Methomyl	16752-77-5	1000.00	3.00	0.00	5.00	0.00	5.00	5.00	1.00
24	Methyl bromide SUB	74-83-9	135.00	3.00	0.00	5.00	1.00	3.75	4.38	5.00
25	Potassium Hydroxide	1310-58-3	x	4.00	1.00	3.75	0.00	5.00	4.38	1.00
26	Potassium dichromate R	7778-50-9	14.00	4.00	1.00	3.75	0.00	5.00	4.38	1.00
27	Aniline	62-53-3	254.00	3.00	0.00	5.00	2.00	2.50	3.75	2.50
28	Cobalt dichloride IPR	7646-79-9	17.00	4.00	0.00	5.00	0.00	5.00	5.00	1.00
29	Chlorpyrifos	2921-88-2	409.00	3.00	0.00	5.00	0.00	5.00	5.00	1.00
30	Sodium dodecyl sulfate IPR	151-21-3	210.00	3.00	0.00	5.00	0.00	5.00	5.00	1.00
31	Sodium chloride SUB	7647-14-5	2600.00	2.00	0.00	5.00	0.00	5.00	5.00	1.00
32	Boron trifluoride R and as 40% HF	7637-07-2	564.30	3.00	1.00	3.75	0.00	5.00	4.38	5.00
33	Methylene chloride IPR	75-09-2	916.00	3.00	0.00	5.00	1.00	3.75	4.38	2.50
34	Sodium chlorate IPR M	7775-09-9	596.00	3.00	2.00	2.50	0.00	5.00	3.75	1.00
35	Hydrogen peroxide	7722-84-1	4060.00	2.00	3.00	1.25	0.00	5.00	3.13	2.50
36	Isobutyl alcohol R	78-83-1	3400.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
37	Methyl alcohol R	67-56-1	15800.00	1.00	0.00	5.00	3.00	1.25	3.13	2.50
38	Fluorotrichloromethane IPR Mouse	75-69-4	1743.00	2.00	0.00	5.00	0.00	5.00	5.00	5.00
39	Hydrogen sulfide IIPR M	7783-06-4	15.34	4.00	0.00	5.00	4.00	0.00	2.50	5.00
40	OMPA	152-16-9	15.00	4.00	0.00	5.00	0.00	5.00	5.00	2.50
41	Chloroform R	67-66-3	3980.00	2.00	0.00	5.00	0.00	5.00	5.00	2.50
42	Lindane	58-89-9	414.00	3.00	0.00	5.00	0.00	5.00	5.00	1.00

Rank	Chemical and Toxicity Data Source	Toxic (Operational) Hazard Score	DWCP Data				Probability Section		Total Score
	Chemical Dermal Toxicity: LD50 Dermal Rat>Rabbit>Guinea Pig>Mouse>LD50 Subcutaneous>LD50 Intraperitoneal>LDLo Dermal Coding: M = mouse, R = rabbit, GP = guinea pig, MIN-LD value reported is the minimum, Intraperitoneal = IPR, Subcutaneous = SUB		# of Countries Producing	Production Score	# of Global Distribution Sites	Distribution Score	Relative Probability Score	Threat Scores	
1	Ammonia (as ammonium hydroxide) SUB LDLo R	13.38	56.00	5.00	348.00	5.00	10.00	5.00	28.38
2	Hydrogen chloride IPR Mouse	13.38	63.00	5.00	528.00	5.00	10.00	0.50	23.88
3	Sulfuric acid	10.25	66.00	5.00	544.00	5.00	10.00	2.50	22.75
4	Formaldehyde (Formalin solution-37% methanol) R	11.75	53.00	5.00	260.00	5.00	10.00	0.50	22.25
5	Nitric acid TDLo	12.50	49.00	4.00	226.00	5.00	9.00	0.50	22.00
6	Hydrogen fluoride LDLo M	12.38	25.00	2.00	138.00	5.00	7.00	2.50	21.88
7	Mercury Tdlo, H, SUB	10.50	14.00	1.00	24.00	3.00	4.00	5.00	19.50
8	Ammonium Chloride MIN	7.38	25.00	2.00	141.00	5.00	7.00	5.00	19.38
9	Hydrogen bromide IPR	14.00	16.00	1.00	73.00	4.00	5.00	0.00	19.00
10	Sodium hydroxide IPR M	8.38	64.00	5.00	477.00	5.00	10.00	0.50	18.88
11	Acetic acid	9.25	40.00	4.00	186.00	5.00	9.00	0.50	18.75
12	Sodium cyanide R	10.00	21.00	2.00	52.00	4.00	6.00	2.50	18.50
13	Dibasic sodium phosphate IPR	9.00	22.00	2.00	125.00	5.00	7.00	2.50	18.50
14	Ethyl alcohol IPR	7.63	51.00	5.00	321.00	5.00	10.00	0.50	18.13
15	Phosphoric acid	9.00	49.00	4.00	245.00	5.00	9.00	0.00	18.00
16	Calcium Hydroxide R	7.38	38.00	3.00	144.00	5.00	8.00	2.50	17.88
17	Potassium cyanide SUB R	11.00	14.00	1.00	23.00	3.00	4.00	2.50	17.50
18	Tetrafluoroboric acid IPR	11.88	17.00	1.00	60.00	4.00	5.00	0.50	17.38
19	1,3-Butadiene	9.25	31.00	3.00	111.00	5.00	8.00	0.00	17.25
20	Sodium Nitrate IPR	7.75	23.00	2.00	124.00	5.00	7.00	2.50	17.25
21	Benzene R	7.63	42.00	4.00	291.00	5.00	9.00	0.50	17.13
22	Toluene	7.63	40.00	4.00	237.00	5.00	9.00	0.50	17.13
23	Methomyl	9.00	9.00	0.00	46.00	3.00	3.00	5.00	17.00
24	Methyl bromide SUB	12.38	10.00	1.00	17.00	3.00	4.00	0.50	16.88
25	Potassium Hydroxide	9.38	24.00	2.00	107.00	5.00	7.00	0.50	16.88
26	Potassium dichromate R	9.38	17.00	1.00	69.00	4.00	5.00	2.50	16.88
27	Aniline	9.25	16.00	1.00	64.00	4.00	5.00	2.50	16.75
28	Cobalt dichloride IPR	10.00	22.00	2.00	90.00	4.00	6.00	0.50	16.50
29	Chlorpyrifos	9.00	17.00	1.00	71.00	4.00	5.00	2.50	16.50
30	Sodium dodecyl sulfate IPR	9.00	27.00	2.00	104.00	5.00	7.00	0.50	16.50
31	Sodium chloride SUB	8.00	38.00	3.00	175.00	5.00	8.00	0.50	16.50
32	Boron trifluoride R and as 40% HF	12.38	11.00	1.00	28.00	3.00	4.00	0.00	16.38
33	Methylene chloride IPR	9.88	21.00	2.00	83.00	4.00	6.00	0.50	16.38
34	Sodium chlorate IPR M	7.75	20.00	2.00	59.00	4.00	6.00	2.50	16.25
35	Hydrogen peroxide	7.63	38.00	3.00	172.00	5.00	8.00	0.50	16.13
36	Isobutyl alcohol R	7.63	27.00	2.00	80.00	4.00	6.00	2.50	16.13
37	Methyl alcohol R	6.63	47.00	4.00	268.00	5.00	9.00	0.50	16.13
38	Fluorotrichloromethane IPR Mouse	12.00	12.00	1.00	18.00	3.00	4.00	0.00	16.00
39	Hydrogen sulfide IIPR M	11.50	15.00	1.00	24.00	3.00	4.00	0.50	16.00
40	OMPA	11.50	11.00	1.00	22.00	3.00	4.00	0.50	16.00
41	Chloroform R	9.50	20.00	2.00	81.00	4.00	6.00	0.50	16.00
42	Lindane	9.00	3.00	0.00	9.00	2.00	2.00	5.00	16.00

Rank	Chemical and Toxicity Data Source	CAS Number	Dermal Toxicity Value	Dermal Toxicity Score	Reactivity Number	Reactivity Score	Flammability Number	Flammability Score	Stability Score	Physical State
	Chemical Dermal Toxicity: LD50 Dermal Rat>Rabbit>Guinea Pig>Mouse>LD50 Subcutaneous>LD50 Intraperitoneal>LDLo Dermal Coding: M = mouse, R = rabbit, GP = guinea pig, MIN- LD value reported is the minimum, Intraperitoneal = IPR, Subcutaneous = SUB		in mg/kg (for values reported in ul/kg, the values were converted to mg/kg based on the density of the chemical at STP)							
43	Silver nitrate IPR	7761-88-8	83.00	4.00	1.00	3.75	0.00	5.00	4.38	1.00
44	Lead nitrate IPR M	10099-74-8	74.00	4.00	1.00	3.75	0.00	5.00	4.38	1.00
45	Ethylene oxide SUB	75-21-8	187.00	3.00	3.00	1.25	4.00	0.00	0.63	5.00
46	Tetrachloroethylene SUB M	127-18-4	65.00	4.00	0.00	5.00	0.00	5.00	5.00	2.50
47	Cadmium SUB	7440-43-9	9.00	5.00	0.00	5.00	0.00	5.00	5.00	1.00
48	Potassium fluoride IPR	7789-23-3	64.00	4.00	0.00	5.00	0.00	5.00	5.00	1.00
49	Mercuric chloride	7487-94-7	41.00	4.00	0.00	5.00	0.00	5.00	5.00	1.00
50	Dichlorvos R	62-73-7	107.00	3.00	0.00	5.00	1.00	3.75	4.38	2.50
51	Cyclohexanone R	108-94-1	1000.00	3.00	0.00	5.00	2.00	2.50	3.75	2.50
52	Ethanolamine R	141-43-5	1000.00	3.00	0.00	5.00	2.00	2.50	3.75	2.50
53	Phenol	108-95-2	669.00	3.00	0.00	5.00	2.00	2.50	3.75	1.00
54	Paracetamol SUB M	103-90-2	310.00	3.00	0.00	5.00	2.00	2.50	3.75	1.00
55	Kerosene IPR	8008-20-6	10700.00	1.00	0.00	5.00	2.00	2.50	3.75	2.50
56	Nitrobenzene	98-95-3	2100.00	2.00	1.00	3.75	2.00	2.50	3.13	2.50
57	Ethyl acetate R	141-78-6	20000.00	1.00	0.00	5.00	3.00	1.25	3.13	2.50
58	Isopropyl alcohol R	67-63-0	12800.00	1.00	0.00	5.00	3.00	1.25	3.13	2.50
59	Deltamethrin MIN	52918-63-5	800.00	3.00	0.00	5.00	0.00	5.00	5.00	2.50
60	Cypermethrin I as in pyrethrum)	52315-07-8	1600.00	2.00	0.00	5.00	0.00	5.00	5.00	2.50
61	Chloroacetyl chloride E3	79-04-9	316.00	3.00	1.00	3.75	3.00	1.25	2.50	2.50
62	Diethylene glycol R	111-46-6	11890.00	1.00	0.00	5.00	1.00	3.75	4.38	2.00
63	Phosphine TDLo IPR	7803-51-2	4.00	5.00	2.00	2.50	4.00	0.00	1.25	5.00
64	n-Butyl alcohol R	71-36-3	3400.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
65	Acetone	67-64-1	20000.00	1.00	0.00	5.00	3.00	1.25	3.13	2.50
66	n-Butyl acetate MIN	123-86-4	17600.00	1.00	0.00	5.00	3.00	1.25	3.13	2.50
67	Strychnine Sulfate SUB	60-41-3	1.70	5.00	0.00	5.00	0.00	5.00	5.00	1.00
68	Ethylamine R	75-04-7	270.00	3.00	0.00	5.00	4.00	0.00	2.50	5.00
69	Methylamine GP LDLo	74-89-5	200.00	3.00	0.00	5.00	4.00	0.00	2.50	5.00
70	Endosulfan	115-29-7	34.00	4.00	0.00	5.00	0.00	5.00	5.00	1.00
71	Sodium fluoride SUB	7681-49-4	175.00	3.00	0.00	5.00	0.00	5.00	5.00	1.00
72	Potassium orthophosphate R MIN	7778-53-2	4640.00	2.00	0.00	5.00	0.00	5.00	5.00	1.00
73	Hexafluoroacetone E3	684-16-2	13.00	4.00	2.00	2.50	0.00	5.00	5.00	2.50
74	Methyl iodide GP	74-88-4	800.00	3.00	0.00	5.00	1.00	3.75	4.38	2.50
75	Oxalic acid IPR M	144-62-7	270.00	3.00	0.00	5.00	1.00	3.75	4.38	1.00
76	Iron oxide	1309-37-1	3100.00	2.00	0.00	5.00	1.00	3.75	4.38	1.00
77	Styrene R	100-42-5	898.00	3.00	2.00	2.50	3.00	1.25	1.88	2.50
78	Phosphorus LDLo R	7723-14-0	10.00	5.00	1.00	3.75	1.00	3.75	3.75	1.00
79	Formic acid IPR M	64-18-6	940.00	2.00	0.00	5.00	2.00	2.50	3.75	2.50
80	Parathion *	56-38-2	6.80	5.00	2.00	2.50	1.00	3.75	3.13	2.50
81	Tetrahydrofuran IPR	109-99-9	2900.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
82	Cyclohexane IRR	110-82-7	1548.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
83	Thiram SUB	137-26-8	646.00	3.00	0.00	5.00	0.00	5.00	5.00	1.00
84	Methyl chloroform R SUB	71-55-6	500.00	3.00	0.00	5.00	1.00	3.75	4.38	2.50
85	Tributyl phosphate IPR	126-73-8	251.00	3.00	0.00	5.00	1.00	3.75	4.38	2.50
86	Paraquat* (dichloride)	1910-42-5	236.00	3.00	1.00	3.75	0.00	5.00	4.38	1.00
87	Cobalt (II) nitrate SUB	10141-05-6	171.00	3.00	1.00	3.75	0.00	5.00	4.38	1.00
88	Dibutyl phthalate MIN	84-74-2	20000.00	1.00	0.00	5.00	1.00	3.75	4.38	2.50

Rank	Chemical and Toxicity Data Source	Toxic (Operational) Hazard Score	DWCP Data				Probability Section		Total Score
	Chemical Dermal Toxicity: LD50 Dermal Rat>Rabbit>Guinea Pig>Mouse>LD50 Subcutaneous>LD50 Intraperitoneal>LDLo Dermal Coding: M = mouse, R = rabbit, GP = guinea pig, MIN- LD value reported is the minimum, Intraperitoneal = IPR, Subcutaneous = SUB		# of Countries Producing	Production Score	# of Global Distribution Sites	Distribution Score	Relative Probability Score	Threat Scores	
43	Silver nitrate IPR	9.38	22.00	2.00	80.00	4.00	6.00	0.50	15.88
44	Lead nitrate IPR M	9.38	16.00	1.00	49.00	3.00	4.00	2.50	15.88
45	Ethylene oxide SUB	8.63	32.00	3.00	84.00	4.00	7.00	0.00	15.63
46	Tetrachloroethylene SUB M	11.50	17.00	1.00	43.00	3.00	4.00	0.00	15.50
47	Cadmium SUB	11.00	19.00	1.00	37.00	3.00	4.00	0.50	15.50
48	Potassium fluoride IPR	10.00	14.00	1.00	82.00	4.00	5.00	0.50	15.50
49	Mercuric chloride	10.00	9.00	0.00	21.00	3.00	3.00	2.50	15.50
50	Dichlorvos R	9.88	12.00	1.00	52.00	4.00	5.00	0.50	15.38
51	Cyclohexanone R	9.25	25.00	2.00	72.00	4.00	6.00	0.00	15.25
52	Ethanolamine R	9.25	20.00	2.00	72.00	4.00	6.00	0.00	15.25
53	Phenol	7.75	26.00	2.00	129.00	5.00	7.00	0.50	15.25
54	Paracetamol SUB M	7.75	23.00	2.00	106.00	5.00	7.00	0.50	15.25
55	Kerosene IPR	7.25	35.00	3.00	102.00	5.00	8.00	0.00	15.25
56	Nitrobenzene	7.63	12.00	1.00	55.00	4.00	5.00	2.50	15.13
57	Ethyl acetate R	6.63	30.00	3.00	139.00	5.00	8.00	0.50	15.13
58	Isopropyl alcohol R	6.63	24.00	2.00	90.00	4.00	6.00	2.50	15.13
59	Deltamethrin MIN	10.50	15.00	1.00	41.00	3.00	4.00	0.50	15.00
60	Cypermethrin I as in pyrethrum)	9.50	15.00	1.00	89.00	4.00	5.00	0.50	15.00
61	Chloroacetyl chloride E3	8.00	25.00	2.00	179.00	5.00	7.00	0.00	15.00
62	Diethylene glycol R	7.38	30.00	3.00	94.00	4.00	7.00	0.50	14.88
63	Phosphine TDLo IPR	11.25	9.00	0.00	13.00	3.00	3.00	0.50	14.75
64	n-Butyl alcohol R	7.63	26.00	2.00	106.00	5.00	7.00	0.00	14.63
65	Acetone	6.63	30.00	3.00	146.00	5.00	8.00	0.00	14.63
66	n-Butyl acetate MIN	6.63	30.00	3.00	124.00	5.00	8.00	0.00	14.63
67	Strychnine Sulfate SUB	11.00	1.00	0.00	3.00	1.00	1.00	2.50	14.50
68	Ethylamine R	10.50	14.00	1.00	33.00	3.00	4.00	0.00	14.50
69	Methylamine GP LDLo	10.50	14.00	1.00	46.00	3.00	4.00	0.00	14.50
70	Endosulfan	10.00	11.00	1.00	32.00	3.00	4.00	0.50	14.50
71	Sodium fluoride SUB	9.00	16.00	1.00	85.00	4.00	5.00	0.50	14.50
72	Potassium orthophosphate R MIN	8.00	11.00	1.00	33.00	3.00	4.00	2.50	14.50
73	Hexafluoroacetone E3	11.50	6.00	0.00	18.00	3.00	3.00	0.00	14.50
74	Methyl iodide GP	9.88	10.00	1.00	40.00	3.00	4.00	0.50	14.38
75	Oxalic acid IPR M	8.38	16.00	1.00	106.00	5.00	6.00	0.00	14.38
76	Iron oxide	7.38	27.00	2.00	141.00	5.00	7.00	0.00	14.38
77	Styrene R	7.38	28.00	2.00	104.00	5.00	7.00	0.00	14.38
78	Phosphorus LDLo R	9.75	11.00	1.00	49.00	3.00	4.00	0.50	14.25
79	Formic acid IPR M	8.25	26.00	2.00	84.00	4.00	6.00	0.00	14.25
80	Parathion *	10.63	3.00	0.00	11.00	3.00	3.00	0.50	14.13
81	Tetrahydrofuran IPR	7.63	21.00	2.00	65.00	4.00	6.00	0.50	14.13
82	Cyclohexane IRR	7.63	26.00	2.00	75.00	4.00	6.00	0.50	14.13
83	Thiram SUB	9.00	17.00	1.00	72.00	4.00	5.00	0.00	14.00
84	Methyl chloroform R SUB	9.88	14.00	1.00	20.00	3.00	4.00	0.00	13.88
85	Tributyl phosphate IPR	9.88	10.00	1.00	37.00	3.00	4.00	0.00	13.88
86	Paraquat* (dichloride)	8.38	8.00	0.00	29.00	3.00	3.00	2.50	13.88
87	Cobalt (II) nitrate SUB	8.38	18.00	1.00	70.00	4.00	5.00	0.50	13.88
88	Dibutyl phthalate MIN	7.88	27.00	2.00	88.00	4.00	6.00	0.00	13.88

Rank	Chemical and Toxicity Data Source Chemical Dermal Toxicity: LD50 Dermal Rat>Rabbit>Guinea Pig>Mouse>LD50 Subcutaneous>LD50 Intraperitoneal>LDLo Dermal Coding: M = mouse, R = rabbit, GP = guinea pig, MIN-LD value reported is the minimum, Intraperitoneal = IPR, Subcutaneous = SUB	CAS Number	Dermal Toxicity Value in mg/kg (for values reported in ul/kg, the values were converted to mg/kg based on the density of the chemical at STP)	Dermal Toxicity Score	Reactivity Number	Reactivity Score	Flammability Number	Flammability Score	Stability Score	Physical State
89	Phosphoryl Trichloride	10025-87-3	1000.00	3.00	2.00	2.50	0.00	5.00	3.75	2.50
90	Dimethylformamide	68-12-2	3160.00	2.00	0.00	5.00	2.00	2.50	3.75	2.50
91	Sodium sulfide IPR	1313-82-2	147.00	3.00	1.00	3.75	1.00	3.75	3.75	1.00
92	Naphthalene MIN	91-20-3	2500.00	2.00	0.00	5.00	2.00	2.50	3.75	1.00
93	Diethylamine	109-89-7	580.60	4.00	0.00	5.00	3.00	1.25	3.13	2.50
94	Dimethyl sulfate SUB R	77-78-1	53.00	4.00	1.00	3.75	2.00	2.50	3.13	2.50
95	Hexone GP IPR	108-10-1	800.00	3.00	0.00	5.00	3.00	1.25	3.13	2.50
96	FurfuralR	98-01-1	620.00	3.00	1.00	3.75	2.00	2.50	3.13	2.50
97	2-Butanone IPR	78-93-3	607.00	3.00	0.00	5.00	3.00	1.25	3.13	2.50
98	n-Hexane TDLo	110-54-3	9100.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
99	Ethylene dichloride R	107-06-2	2800.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
100	Xylenes R	95-47-6	14100.00	1.00	0.00	5.00	3.00	1.25	3.13	2.50
101	Cyanide R as sodium cyanide	57-12-5	4.30	5.00	0.00	5.00	0.00	5.00	5.00	2.50
102	Phosdrin (Mevinphos)	7786-34-7	4.20	5.00	0.00	5.00	0.00	5.00	5.00	2.50
103	Aldicarb	116-06-3	2.50	5.00	0.00	5.00	0.00	5.00	5.00	1.00
104	Ethylene dibromide	106-93-4	300.00	3.00	0.00	5.00	0.00	5.00	5.00	2.50
105	Arsenic SUB	7440-38-2	75.00	4.00	0.00	5.00	0.00	5.00	5.00	1.00
106	Methamidophos	10265-92-6	50.00	4.00	0.00	5.00	0.00	5.00	5.00	1.00
107	Chlorine dioxide	10049-04-4	5000.00	2.00	4.00	0.00	0.00	5.00	2.50	5.00
108	Malathion	121-75-5	4444.00	2.00	0.00	5.00	0.00	5.00	5.00	2.50
109	Dimethylamine R	124-40-3	2010.00	2.00	0.00	5.00	4.00	0.00	2.50	5.00
110	Dimethoate GP	60-51-5	965.00	3.00	0.00	5.00	0.00	5.00	5.00	1.00
111	Red mercuric oxide	21908-53-2	315.00	3.00	0.00	5.00	0.00	5.00	5.00	1.00
112	Carbendazim R MIN	10605-21-7	10000.00	2.00	0.00	5.00	0.00	5.00	5.00	1.00
113	Copper oxychloride	1332-40-7	2000.00	2.00	0.00	5.00	0.00	5.00	5.00	1.00
114	Trimethylamine-E3*	75-50-3	800.00	3.00	0.00	5.00	4.00	0.00	5.00	2.50
115	Di-syston R	298-04-4	5.00	5.00	0.00	5.00	1.00	3.75	4.38	2.50
116	TEPP	107-49-3	2.40	5.00	1.00	3.75	0.00	5.00	4.38	2.50
117	2,6-di-tert-butyl-p-cresol IPR	128-37-0	100.00	4.00	0.00	5.00	1.00	3.75	4.38	1.00
118	Epichlorohydrin #(I)	106-89-8	1.00	5.00	2.00	2.50	3.00	1.25	1.88	2.50
119	Acrylonitrile	107-13-1	63.00	4.00	2.00	2.50	3.00	1.25	1.88	2.50
120	Trichloroethylene	79-01-6	20000.00	1.00	0.00	5.00	1.00	3.75	4.38	2.50
121	Hydrogen cyanide SUB M	74-90-8	3.00	5.00	2.00	2.50	4.00	0.00	1.25	2.50
122	Dichloroethyl ether R	111-44-4	90.00	4.00	0.00	5.00	2.00	2.50	3.75	2.50
123	Nitrogen trifluoride IPR	7783-54-2	26.00	4.00	3.00	1.25	3.00	1.25	1.25	5.00
124	Cyclohexanol R	108-93-0	1000.00	3.00	0.00	5.00	2.00	2.50	3.75	2.50
125	Ethylenediamine	107-15-3	655.54	3.00	0.00	5.00	2.00	2.50	3.75	2.50
126	Phosphorus trichloride	7719-12-2	1260.00	2.00	2.00	2.50	0.00	5.00	3.75	2.50
127	p-Phenylene diamine IPR	106-50-3	37.00	4.00	1.00	3.75	2.00	2.50	3.13	1.00
128	Demeton	8065-48-3	8.20	5.00	0.00	5.00	0.00	5.00	5.00	2.50
129	Profenofos #(I)	41198-08-7	1610.00	2.00	0.00	5.00	0.00	5.00	5.00	2.50
130	Carbon tetrachloride R MIN	56-23-5	20000.00	1.00	0.00	5.00	0.00	5.00	5.00	2.50
131	Propyl chloroformate-T3*	109-61-5	10.00	5.00	0.00	5.00	3.00	1.25	2.50	2.50
132	Acetone cyanohydrin, stabilized *T-3	75-86-5	17.00	4.00	2.00	2.50	2.00	2.50	2.50	2.50
133	Acetyl Bromide *T3	506-96-7	50.00	4.00	2.00	2.50	2.00	2.50	2.50	2.50
134	Mercuric nitrate	10045-94-0	75.00	4.00	1.00	3.75	0.00	5.00	4.38	1.00

Rank	Chemical and Toxicity Data Source	Toxic (Operational) Hazard Score	DWCP Data				Probability Section		Total Score
	Chemical Dermal Toxicity: LD50 Dermal Rat>Rabbit>Guinea Pig>Mouse>LD50 Subcutaneous>LD50 Intraperitoneal>LDLo Dermal Coding: M = mouse, R = rabbit, GP = guinea pig, MIN-LD value reported is the minimum, Intraperitoneal = IPR, Subcutaneous = SUB		# of Countries Producing	Production Score	# of Global Distribution Sites	Distribution Score	Relative Probability Score	Threat Scores	
89	Phosphoryl Trichloride	9.25	14.00	1.00	50.00	3.00	4.00	0.50	13.75
90	Dimethylformamide	8.25	19.00	1.00	64.00	4.00	5.00	0.50	13.75
91	Sodium sulfide IPR	7.75	21.00	2.00	86.00	4.00	6.00	0.00	13.75
92	Naphthalene MIN	6.75	25.00	2.00	103.00	5.00	7.00	0.00	13.75
93	Diethylamine	9.63	16.00	1.00	39.00	3.00	4.00	0.00	13.63
94	Dimethyl sulfate SUB R	9.63	12.00	1.00	39.00	3.00	4.00	0.00	13.63
95	Hexone GP IPR	8.63	17.00	1.00	52.00	4.00	5.00	0.00	13.63
96	FurfuralR	8.63	19.00	1.00	66.00	4.00	5.00	0.00	13.63
97	2-Butanone IPR	8.63	18.00	1.00	63.00	4.00	5.00	0.00	13.63
98	n-Hexane TDLo	7.63	23.00	2.00	78.00	4.00	6.00	0.00	13.63
99	Ethylene dichloride R	7.63	28.00	2.00	70.00	4.00	6.00	0.00	13.63
100	Xylenes R	6.63	32.00	3.00	76.00	4.00	7.00	0.00	13.63
101	Cyanide R as sodium cyanide	12.50	1.00	0.00	1.00	1.00	1.00	0.00	13.50
102	Phosdrin (Mevinphos)	12.50	4.00	0.00	5.00	1.00	1.00	0.00	13.50
103	Aldicarb	11.00	4.00	0.00	6.00	2.00	2.00	0.50	13.50
104	Ethylene dibromide	10.50	7.00	0.00	27.00	3.00	3.00	0.00	13.50
105	Arsenic SUB	10.00	6.00	0.00	11.00	3.00	3.00	0.50	13.50
106	Methamidophos	10.00	9.00	0.00	45.00	3.00	3.00	0.50	13.50
107	Chlorine dioxide	9.50	14.00	1.00	33.00	3.00	4.00	0.00	13.50
108	Malathion	9.50	11.00	1.00	33.00	3.00	4.00	0.00	13.50
109	Dimethylamine R	9.50	14.00	1.00	41.00	3.00	4.00	0.00	13.50
110	Dimethoate GP	9.00	11.00	1.00	39.00	3.00	4.00	0.50	13.50
111	Red mercuric oxide	9.00	11.00	1.00	26.00	3.00	4.00	0.50	13.50
112	Carbendazim R MIN	8.00	16.00	1.00	62.00	4.00	5.00	0.50	13.50
113	Copper oxychloride	8.00	21.00	2.00	41.00	3.00	5.00	0.50	13.50
114	Trimethylamine-E3*	10.50	8.00	0.00	41.00	3.00	3.00	0.00	13.50
115	Di-syston R	11.88	3.00	0.00	3.00	1.00	1.00	0.50	13.38
116	TEPP	11.88	1.00	0.00	1.00	1.00	1.00	0.50	13.38
117	2,6-di-tert-butyl-p-cresol IPR	9.38	13.00	1.00	48.00	3.00	4.00	0.00	13.38
118	Epichlorohydrin #(I)	9.38	15.00	1.00	34.00	3.00	4.00	0.00	13.38
119	Acrylonitrile	8.38	16.00	1.00	53.00	4.00	5.00	0.00	13.38
120	Trichloroethylene	7.88	17.00	1.00	55.00	4.00	5.00	0.50	13.38
121	Hydrogen cyanide SUB M	8.75	13.00	1.00	25.00	3.00	4.00	0.50	13.25
122	Dichloroethyl ether R	10.25	4.00	0.00	12.00	3.00	3.00	0.00	13.25
123	Nitrogen trifluoride IPR	10.25	7.00	0.00	16.00	3.00	3.00	0.00	13.25
124	Cyclohexanol R	9.25	15.00	1.00	27.00	3.00	4.00	0.00	13.25
125	Ethylenediamine	9.25	12.00	1.00	32.00	3.00	4.00	0.00	13.25
126	Phosphorus trichloride	8.25	11.00	1.00	57.00	4.00	5.00	0.00	13.25
127	p-Phenylene diamine IPR	8.13	12.00	1.00	52.00	4.00	5.00	0.00	13.13
128	Demeton	12.50	0.00	0.00	0.00	0.00	0.00	0.50	13.00
129	Profenofos #(I)	9.50	4.00	0.00	21.00	3.00	3.00	0.50	13.00
130	Carbon tetrachloride R MIN	8.50	16.00	1.00	49.00	3.00	4.00	0.50	13.00
131	Propyl chloroformate-T3*	10.00	2.00	0.00	12.00	3.00	3.00	0.00	13.00
132	Acetone cyanohydrin, stabilized *T-3	9.00	13.00	1.00	22.00	3.00	4.00	0.00	13.00
133	Acetyl Bromide *T3	9.00	10.00	1.00	23.00	3.00	4.00	0.00	13.00
134	Mercuric nitrate	9.38	8.00	0.00	14.00	3.00	3.00	0.50	12.88

Rank	Chemical and Toxicity Data Source	CAS Number	Dermal Toxicity Value	Dermal Toxicity Score	Reactivity Number	Reactivity Score	Flammability Number	Flammability Score	Stability Score	Physical State
	Chemical Dermal Toxicity: LD50 Dermal Rat>Rabbit>Guinea Pig>Mouse>LD50 Subcutaneous>LD50 Intraperitoneal>LDLo Dermal Coding: M = mouse, R = rabbit, GP = guinea pig, MIN- LD value reported is the minimum, Intraperitoneal = IPR, Subcutaneous = SUB		in mg/kg (for values reported in ul/kg, the values were converted to mg/kg based on the density of the chemical at STP)							
135	Methyl parathion	298-00-0	67.00	4.00	0.00	5.00	1.00	3.75	4.38	1.00
136	Dimethylphthalate MIN	131-11-3	4800.00	2.00	0.00	5.00	1.00	3.75	4.38	2.50
137	Methidathion R	950-37-8	196.00	3.00	0.00	5.00	1.00	3.75	4.38	1.00
138	Imidacloprid MIN	105827-78-9	5000.00	2.00	0.00	5.00	1.00	3.75	4.38	1.00
139	Acephate MIN	30560-19-1	2000.00	2.00	0.00	5.00	1.00	3.75	4.38	1.00
140	Ammonium persulfate	7727-54-0	2000.00	2.00	1.00	3.75	0.00	5.00	4.38	1.00
141	Barium nitrate	10022-31-8	1200.00	2.00	1.00	3.75	0.00	5.00	4.38	1.00
142	1-methyl imidazole IPR	616-47-7	380.00	3.00	0.00	5.00	2.00	2.50	3.75	2.50
143	Quinone IPR	106-51-4	30.00	4.00	0.00	5.00	2.00	2.50	3.75	1.00
144	Tetramethylethylenediamine R	110-18-9	5390.00	2.00	0.00	5.00	2.00	2.50	3.75	2.50
145	Furfuryl alcohol	98-00-0	400.00	3.00	1.00	3.75	2.00	2.50	3.13	2.50
146	Acetic anhydride	108-24-7	4320.00	2.00	1.00	3.75	2.00	2.50	3.13	2.50
147	Isoamyl alcohol (primary and secondary) R	123-51-3	3215.70	2.00	0.00	5.00	3.00	1.25	3.13	2.50
148	Ethyl benzene R	100-41-4	17800.00	1.00	0.00	5.00	3.00	1.25	3.13	2.50
149	Isobutyl acetate R MIN	110-19-0	17400.00	1.00	0.00	5.00	3.00	1.25	3.13	2.50
150	TEDP	3689-24-5	65.00	4.00	0.00	5.00	0.00	5.00	5.00	2.50
151	Fenpropathrin	39515-41-8	870.00	3.00	0.00	5.00	0.00	5.00	5.00	1.00
152	Bromoform R	75-25-2	15800.00	1.00	0.00	5.00	0.00	5.00	5.00	2.50
153	1,1,2-Trichloro 1,2,2-trifluoroethane	76-13-1	12000.00	1.00	0.00	5.00	0.00	5.00	5.00	2.50
154	Iron phosphate MIN	10045-86-0	5000.00	2.00	0.00	5.00	0.00	5.00	5.00	1.00
155	Metribuzin	21087-64-9	2000.00	2.00	0.00	5.00	0.00	5.00	5.00	1.00
156	Iodine SUB	7553-56-2	10500.00	1.00	0.00	5.00	0.00	5.00	5.00	1.00
157	Cyanogen T3	460-19-5	13.00	4.00	1.00	3.75	4.00	0.00	5.00	2.50
158	Oxydemeton-methyl #(I)	301-12-2	100.00	4.00	0.00	5.00	1.00	3.75	4.38	2.50
159	Diphenyl Ether R	101-84-8	7940.00	2.00	0.00	5.00	1.00	3.75	4.38	2.50
160	Fenvalerate MIN	51630-58-1	5000.00	2.00	0.00	5.00	1.00	3.75	4.38	2.50
161	Ethyl ether IPR	60-29-7	2400.00	2.00	1.00	3.75	4.00	0.00	1.88	2.50
162	2-Butoxyethanol	111-76-2	490.00	3.00	0.00	5.00	2.00	2.50	3.75	2.50
163	Ethylene chlorohydrin	107-07-3	293.00	3.00	0.00	5.00	2.00	2.50	3.75	2.50
164	Phenylhydrazine IPR M	100-63-0	170.00	3.00	0.00	5.00	2.00	2.50	3.75	2.50
165	Sodium azide	26628-22-8	50.00	4.00	2.00	2.50	0.00	5.00	3.75	1.00
166	o-Toluidine R	95-53-4	3250.00	2.00	0.00	5.00	2.00	2.50	3.75	2.50
167	Dimethyl acetamide R	127-19-5	2240.00	2.00	0.00	5.00	2.00	2.50	3.75	2.50
168	N,N-Dimethylaniline R	121-69-7	1691.59	2.00	0.00	5.00	2.00	2.50	3.75	2.50
169	n-Propyl alcohol R	71-23-8	5040.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
170	Acetonitrile	75-05-8	2000.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
171	Ethyl bromide IPR	74-96-4	1750.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
172	n-Amyl acetate LDLo IPR GP	628-63-7	1500.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
173	Bromodiolone (Rat Inh. LC50)	54149-17-6	0.63	5.00	0.00	5.00	0.00	5.00	5.00	1.00
174	Phosphamidon	13171-21-6	125.00	3.00	0.00	5.00	0.00	5.00	5.00	2.50
175	Pentachlorophenol	87-86-5	96.00	4.00	0.00	5.00	0.00	5.00	5.00	1.00
176	Chloroform-D as chloroform	865-49-6	3980.00	2.00	0.00	5.00	0.00	5.00	5.00	2.50
177	2 Aminopyridine GP	504-29-0	500.00	3.00	0.00	5.00	0.00	5.00	5.00	1.00
178	Allyl alcohol R	107-18-6	45.00	4.00	1.00	3.75	3.00	1.25	2.50	2.50
179	Carbaryl MIN	63-25-2	2000.00	2.00	0.00	5.00	0.00	5.00	5.00	1.00

Rank	Chemical and Toxicity Data Source	Toxic (Operational) Hazard Score	DWCP Data				Probability Section		Total Score
	Chemical Dermal Toxicity: LD50 Dermal Rat>Rabbit>Guinea Pig>Mouse>LD50 Subcutaneous>LD50 Intraperitoneal>LDLo Dermal Coding: M = mouse, R = rabbit, GP = guinea pig, MIN-LD value reported is the minimum, Intraperitoneal = IPR, Subcutaneous = SUB		# of Countries Producing	Production Score	# of Global Distribution Sites	Distribution Score	Relative Probability Score	Threat Scores	
135	Methyl parathion	9.38	7.00	0.00	25.00	3.00	3.00	0.50	12.88
136	Dimethylphthalate MIN	8.88	16.00	1.00	36.00	3.00	4.00	0.00	12.88
137	Methidathion R	8.38	4.00	0.00	9.00	2.00	2.00	2.50	12.88
138	Imidacloprid MIN	7.38	10.00	1.00	75.00	4.00	5.00	0.50	12.88
139	Acephate MIN	7.38	9.00	0.00	49.00	3.00	3.00	2.50	12.88
140	Ammonium persulfate	7.38	12.00	1.00	57.00	4.00	5.00	0.50	12.88
141	Barium nitrate	7.38	15.00	1.00	72.00	4.00	5.00	0.50	12.88
142	1-methyl imidazole IPR	9.25	8.00	0.00	22.00	3.00	3.00	0.50	12.75
143	Quinone IPR	8.75	12.00	1.00	25.00	3.00	4.00	0.00	12.75
144	Tetramethylethylenediamine R	8.25	10.00	1.00	18.00	3.00	4.00	0.50	12.75
145	Furfuryl alcohol	8.63	12.00	1.00	38.00	3.00	4.00	0.00	12.63
146	Acetic anhydride	7.63	19.00	1.00	55.00	4.00	5.00	0.00	12.63
147	Isoamyl alcohol (primary and secondary) R	7.63	18.00	1.00	60.00	4.00	5.00	0.00	12.63
148	Ethyl benzene R	6.63	21.00	2.00	51.00	4.00	6.00	0.00	12.63
149	Isobutyl acetate R MIN	6.63	21.00	2.00	56.00	4.00	6.00	0.00	12.63
150	TEDP	11.50	1.00	0.00	1.00	1.00	1.00	0.00	12.50
151	Fenpropathrin	9.00	3.00	0.00	19.00	3.00	3.00	0.50	12.50
152	Bromoform R	8.50	10.00	1.00	24.00	3.00	4.00	0.00	12.50
153	1,1,2-Trichloro 1,2,2-trifluoroethane	8.50	12.00	1.00	15.00	3.00	4.00	0.00	12.50
154	Iron phosphate MIN	8.00	5.00	0.00	7.00	2.00	2.00	2.50	12.50
155	Metribuzin	8.00	11.00	1.00	23.00	3.00	4.00	0.50	12.50
156	Iodine SUB	7.00	19.00	1.00	80.00	4.00	5.00	0.50	12.50
157	Cyanogen T3	11.50	2.00	0.00	2.00	1.00	1.00	0.00	12.50
158	Oxydemeton-methyl #(I)	10.88	3.00	0.00	3.00	1.00	1.00	0.50	12.38
159	Diphenyl Ether R	8.88	5.00	0.00	23.00	3.00	3.00	0.50	12.38
160	Fenvalerate MIN	8.88	6.00	0.00	48.00	3.00	3.00	0.50	12.38
161	Ethyl ether IPR	6.38	20.00	2.00	57.00	4.00	6.00	0.00	12.38
162	2-Butoxyethanol	9.25	1.00	0.00	43.00	3.00	3.00	0.00	12.25
163	Ethylene chlorohydrin	9.25	6.00	0.00	17.00	3.00	3.00	0.00	12.25
164	Phenylhydrazine IPR M	9.25	8.00	0.00	23.00	3.00	3.00	0.00	12.25
165	Sodium azide	8.75	8.00	0.00	35.00	3.00	3.00	0.50	12.25
166	o-Toluidine R	8.25	11.00	1.00	32.00	3.00	4.00	0.00	12.25
167	Dimethyl acetamide R	8.25	11.00	1.00	38.00	3.00	4.00	0.00	12.25
168	N,N-Dimethylaniline R	8.25	11.00	1.00	41.00	3.00	4.00	0.00	12.25
169	n-Propyl alcohol R	7.63	18.00	1.00	50.00	3.00	4.00	0.50	12.13
170	Acetonitrile	7.63	19.00	1.00	50.00	3.00	4.00	0.50	12.13
171	Ethyl bromide IPR	7.63	10.00	1.00	37.00	3.00	4.00	0.50	12.13
172	n-Amyl acetate LDLo IPR GP	7.63	14.00	1.00	37.00	3.00	4.00	0.50	12.13
173	Bromodiolone (Rat Inh. LC50)	11.00	1.00	0.00	1.00	1.00	1.00	0.00	12.00
174	Phosphamidon	10.50	3.00	0.00	4.00	1.00	1.00	0.50	12.00
175	Pentachlorophenol	10.00	4.00	0.00	7.00	2.00	2.00	0.00	12.00
176	Chloroform-D as chloroform	9.50	6.00	0.00	10.00	2.00	2.00	0.50	12.00
177	2 Aminopyridine GP	9.00	6.00	0.00	20.00	3.00	3.00	0.00	12.00
178	Allyl alcohol R	9.00	6.00	0.00	13.00	3.00	3.00	0.00	12.00
179	Carbaryl MIN	8.00	10.00	1.00	25.00	3.00	4.00	0.00	12.00

Rank	Chemical and Toxicity Data Source Chemical Dermal Toxicity: LD50 Dermal Rat>Rabbit>Guinea Pig>Mouse>LD50 Subcutaneous>LD50 Intraperitoneal>LDLo Dermal Coding: M = mouse, R = rabbit, GP = guinea pig, MIN-LD value reported is the minimum, Intraperitoneal = IPR, Subcutaneous = SUB	CAS Number	Dermal Toxicity Value in mg/kg (for values reported in ul/kg, the values were converted to mg/kg based on the density of the chemical at STP)	Dermal Toxicity Score	Reactivity Number	Reactivity Score	Flammability Number	Flammability Score	Stability Score	Physical State
180	2,4-D	94-75-7	1500.00	2.00	0.00	5.00	0.00	5.00	5.00	1.00
181	Isopropylamine R	75-31-0	380.00	3.00	0.00	5.00	4.00	0.00	2.50	2.50
182	Allyl chloride	107-05-1	155.00	3.00	1.00	3.75	3.00	1.25	2.50	2.50
183	Thiodiglycol-Alfa MSDS*B71	111-48-8	32.00	4.00	0.00	5.00	1.00	3.75	2.50	2.50
184	Piperidine-T3*	110-89-4	276.00	3.00	0.00	5.00	3.00	1.25	2.50	2.50
185	MDEA-R* (N-Methyldiethanolamine)	105-59-9	6010.00	2.00	0.00	5.00	1.00	3.75	2.50	2.50
186	Acetyl Chloride *T3	75-36-5	910.00	3.00	2.00	2.50	3.00	1.25	2.50	2.50
187	Methyltrichlorosilane-E3*	75-79-6	84.00	4.00	2.00	2.50	3.00	1.25	2.50	2.50
188	Trimethylchlorosilane-E3*	75-77-44	18.00	4.00	2.00	2.50	3.00	1.25	2.50	2.50
189	Titanium tetrachloride-E3*	7550-45-0	160.00	3.00	2.00	2.50	0.00	5.00	2.50	2.50
190	1,1,2-Trichloroethane	79-00-5	970.00	3.00	0.00	5.00	1.00	3.75	4.38	2.50
191	Phenamiphos	22224-92-6	80.00	4.00	0.00	5.00	1.00	3.75	4.38	1.00
192	alpha-Chloroacetophenone IPR	532-27-4	36.00	4.00	0.00	5.00	1.00	3.75	4.38	1.00
193	Acetylene tetrabromide	79-27-6	5250.00	2.00	1.00	3.75	0.00	5.00	4.38	2.50
194	o-Anisidine	90-04-0	3200.00	2.00	0.00	5.00	1.00	3.75	4.38	2.50
195	Mancozeb MIN	8018-01-7	10000.00	2.00	0.00	5.00	1.00	3.75	4.38	1.00
196	Atrazine MIN	1912-24-9	3000.00	2.00	0.00	5.00	1.00	3.75	4.38	1.00
197	Bromobenzene SUB	108-86-1	2000.00	2.00	0.00	5.00	2.00	2.50	3.75	2.50
198	Bromoxynil MIN	1689-84-5	2000.00	2.00	0.00	5.00	2.00	2.50	3.75	2.50
199	2-Diethylaminoethanol R	100-37-8	1260.00	2.00	0.00	5.00	2.00	2.50	3.75	2.50
200	n-Butylamine R	109-73-9	629.85	3.00	0.00	5.00	3.00	1.25	3.13	2.50
201	Isoamyl acetate R MIN	123-92-2	5000.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
202	Methyl acetate R MIN	79-20-9	5000.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
203	sec-Butyl alcohol MIN	78-92-2	2000.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
204	tert-Butyl alcohol R MIN	75-65-0	2000.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
205	Triethylamine	121-44-8	1768.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
206	Methyl Cellosolve R	109-86-4	1280.00	2.00	1.00	3.75	2.00	2.50	3.13	2.50
207	Pyridine	110-86-1	1121.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
208	Nitroglycerin MIN	55-63-0	29.20	4.00	4.00	0.00	3.00	1.25	0.63	2.50
209	Chlorobenzene	108-90-7	15800.00	1.00	0.00	5.00	3.00	1.25	3.13	2.50
210	Trithion	786-19-6	27.00	4.00	0.00	5.00	0.00	5.00	5.00	2.50
211	Mercuric Salicylate LDLo M	5970-32-1	10.00	5.00	0.00	5.00	0.00	5.00	5.00	1.00
212	Sodium fluoroacetate	62-74-8	48.00	4.00	0.00	5.00	0.00	5.00	5.00	1.00
213	1,1,2,2-Tetrachloroethane	79-34-5	6400.00	2.00	0.00	5.00	0.00	5.00	5.00	2.50
214	Buprofezin MIN	69327-76-0	5000.00	2.00	0.00	5.00	0.00	5.00	5.00	1.00
215	Metalaxyl MIN	57837-19-1	3100.00	2.00	0.00	5.00	0.00	5.00	5.00	1.00
216	Dioxane R	123-91-1	7873.00	2.00	1.00	3.75	3.00	1.25	2.50	2.50
217	2-chloroacetophenone	532-27-4	120.00	3.00	0.00	5.00	1.00	3.75	4.38	1.00
218	Hydroquinone R MIN	123-31-9	2000.00	2.00	0.00	5.00	1.00	3.75	4.38	1.00
219	Ethyl acrylate R	140-88-5	500.00	3.00	2.00	2.50	3.00	1.25	1.88	2.50
220	o-Dichlorobenzene R	95-50-1	10000.00	2.00	0.00	5.00	2.00	2.50	3.75	2.50
221	2-Ethoxyethanol	110-80-5	3500.00	2.00	0.00	5.00	2.00	2.50	3.75	2.50
222	Methyl isobutyl carbinol R	108-11-2	2872.92	2.00	0.00	5.00	2.00	2.50	3.75	2.50
223	n-Butyl glycidyl ether MIN	2426-08-6	2150.00	2.00	1.00	3.75	1.00	3.75	3.75	2.50
224	Nitrotoluene (o, m, p isomers) p-isomer MIN	88-72-2; 99-08-1; 99-99-0	2100.00	2.00	1.00	3.75	1.00	3.75	3.75	2.50

Rank	Chemical and Toxicity Data Source	Toxic (Operational) Hazard Score	DWCP Data				Probability Section		Total Score
	Chemical Dermal Toxicity: LD50 Dermal Rat>Rabbit>Guinea Pig>Mouse>LD50 Subcutaneous>LD50 Intraperitoneal>LDLo Dermal Coding: M = mouse, R = rabbit, GP = guinea pig, MIN-LD value reported is the minimum, Intraperitoneal = IPR, Subcutaneous = SUB		# of Countries Producing	Production Score	# of Global Distribution Sites	Distribution Score	Relative Probability Score	Threat Scores	
180	2,4-D	8.00	15.00	1.00	32.00	3.00	4.00	0.00	12.00
181	Isopropylamine R	8.00	13.00	1.00	30.00	3.00	4.00	0.00	12.00
182	Allyl chloride	8.00	11.00	1.00	19.00	3.00	4.00	0.00	12.00
183	Thiodiglycol-Alfa MSDS*B71	9.00	9.00	0.00	12.00	3.00	3.00	0.00	12.00
184	Piperidine-T3*	8.00	11.00	1.00	21.00	3.00	4.00	0.00	12.00
185	MDEA-R* (N-Methyldiethanolamine)	7.00	24.00	2.00	44.00	3.00	5.00	0.00	12.00
186	Acetyl Chloride *T3	8.00	10.00	1.00	37.00	3.00	4.00	0.00	12.00
187	Methyltrichlorosilane-E3*	9.00	3.00	0.00	15.00	3.00	3.00	0.00	12.00
188	Trimethylchlorosilane-E3*	9.00		0.00	30.00	3.00	3.00	0.00	12.00
189	Titanium tetrachloride-E3*	8.00	15.00	1.00	25.00	3.00	4.00	0.00	12.00
190	1,1,2-Trichloroethane	9.88	2.00	0.00	7.00	2.00	2.00	0.00	11.88
191	Phenamiphos	9.38	3.00	0.00	6.00	2.00	2.00	0.50	11.88
192	alpha-Chloroacetophenone IPR	9.38	3.00	0.00	10.00	2.00	2.00	0.50	11.88
193	Acetylene tetrabromide	8.88	6.00	0.00	11.00	3.00	3.00	0.00	11.88
194	o-Anisidine	8.88	5.00	0.00	24.00	3.00	3.00	0.00	11.88
195	Mancozeb MIN	7.38	12.00	1.00	41.00	3.00	4.00	0.50	11.88
196	Atrazine MIN	7.38	10.00	1.00	23.00	3.00	4.00	0.50	11.88
197	Bromobenzene SUB	8.25	8.00	0.00	34.00	3.00	3.00	0.50	11.75
198	Bromoxynil MIN	8.25	5.00	0.00	14.00	3.00	3.00	0.50	11.75
199	2-Diethylaminoethanol R	8.25	0.00	0.00	23.00	3.00	3.00	0.50	11.75
200	n-Butylamine R	8.63	8.00	0.00	19.00	3.00	3.00	0.00	11.63
201	Isoamyl acetate R MIN	7.63	13.00	1.00	46.00	3.00	4.00	0.00	11.63
202	Methyl acetate R MIN	7.63	15.00	1.00	33.00	3.00	4.00	0.00	11.63
203	sec-Butyl alcohol MIN	7.63	12.00	1.00	24.00	3.00	4.00	0.00	11.63
204	tert-Butyl alcohol R MIN	7.63	13.00	1.00	37.00	3.00	4.00	0.00	11.63
205	Triethylamine	7.63	17.00	1.00	46.00	3.00	4.00	0.00	11.63
206	Methyl Cellosolve R	7.63	13.00	1.00	30.00	3.00	4.00	0.00	11.63
207	Pyridine	7.63	15.00	1.00	49.00	3.00	4.00	0.00	11.63
208	Nitroglycerin MIN	7.13	13.00	1.00	22.00	3.00	4.00	0.50	11.63
209	Chlorobenzene	6.63	13.00	1.00	53.00	4.00	5.00	0.00	11.63
210	Trithion	11.50	0.00	0.00	0.00	0.00	0.00	0.00	11.50
211	Mercuric Salicylate LDLo M	11.00	0.00	0.00	0.00	0.00	0.00	0.50	11.50
212	Sodium fluoroacetate	10.00	3.00	0.00	3.00	1.00	1.00	0.50	11.50
213	1,1,2,2-Tetrachloroethane	9.50	6.00	0.00	10.00	2.00	2.00	0.00	11.50
214	Buprofezin MIN	8.00	5.00	0.00	27.00	3.00	3.00	0.50	11.50
215	Metalaxyl MIN	8.00	8.00	0.00	25.00	3.00	3.00	0.50	11.50
216	Dioxane R	7.00	12.00	1.00	34.00	3.00	4.00	0.50	11.50
217	2-chloroacetophenone	8.38	6.00	0.00	11.00	3.00	3.00	0.00	11.38
218	Hydroquinone R MIN	7.38	15.00	1.00	41.00	3.00	4.00	0.00	11.38
219	Ethyl acrylate R	7.38	16.00	1.00	40.00	3.00	4.00	0.00	11.38
220	o-Dichlorobenzene R	8.25	9.00	0.00	37.00	3.00	3.00	0.00	11.25
221	2-Ethoxyethanol	8.25	1.00	0.00	31.00	3.00	3.00	0.00	11.25
222	Methyl isobutyl carbinol R	8.25	9.00	0.00	14.00	3.00	3.00	0.00	11.25
223	n-Butyl glycidyl ether MIN	8.25	7.00	0.00	13.00	3.00	3.00	0.00	11.25
224	Nitrotoluene (o, m, p isomers) p-isomer MIN	8.25	7.00	0.00	19.00	3.00	3.00	0.00	11.25

Rank	Chemical and Toxicity Data Source	CAS Number	Dermal Toxicity Value	Dermal Toxicity Score	Reactivity Number	Reactivity Score	Flammability Number	Flammability Score	Stability Score	Physical State
	Chemical Dermal Toxicity: LD50 Dermal Rat>Rabbit>Guinea Pig>Mouse>LD50 Subcutaneous>LD50 Intraperitoneal>LDLo Dermal Coding: M = mouse, R = rabbit, GP = guinea pig, MIN-LD value reported is the minimum, Intraperitoneal = IPR, Subcutaneous = SUB		in mg/kg (for values reported in ul/kg, the values were converted to mg/kg based on the density of the chemical at STP)							
225	Monomethyl aniline LDLo GP	100-61-8	1200.00	2.00	0.00	5.00	2.00	2.50	3.75	2.50
226	1,2-dimethylimidazole LDLo M IPR	1739-84-0	500.00	3.00	0.00	5.00	2.00	2.50	3.75	1.00
227	Diacetone alcohol R	123-42-2	13500.00	1.00	0.00	5.00	2.00	2.50	3.75	2.50
228	Methyl (n-amyl) ketone R	110-43-0	10332.00	1.00	0.00	5.00	2.00	2.50	3.75	2.50
229	Chloropicrin MIN	76-06-2	200.00	3.00	3.00	1.25	0.00	5.00	3.13	2.50
230	Endrin R	72-20-8	60.00	4.00	0.00	5.00	0.00	5.00	5.00	1.00
231	EPN R	2104-64-5	30.00	4.00	0.00	5.00	0.00	5.00	5.00	1.00
232	Thallium sulfate	7446-18-6	550.00	3.00	0.00	5.00	0.00	5.00	5.00	1.00
233	p-Anisidine	104-94-9	3200.00	2.00	0.00	5.00	0.00	5.00	5.00	1.00
234	Warfarin	81-81-2	1400.00	2.00	0.00	5.00	0.00	5.00	5.00	1.00
235	Ethyl silicate	78-10-4	5877.90	2.00	1.00	3.75	3.00	1.25	2.50	2.50
236	Carbon disulfide R	75-15-0	2025.00	2.00	0.00	5.00	4.00	0.00	2.50	2.50
237	Lithium IPR M	7439-93-2	1000.00	3.00	2.00	2.50	2.00	2.50	2.50	1.00
238	Cumene	98-82-8	12300.00	1.00	1.00	3.75	3.00	1.25	2.50	2.50
239	Cyclohexylamine T3	108-91-8	320.00	3.00	0.00	5.00	3.00	1.25	2.50	2.50
240	Triethanolamine-T3*	102-71-6	18.00	4.00	0.00	5.00	1.00	3.75	2.50	2.50
241	Allylamine *T3	107-11-9	35.00	4.00	1.00	3.75	3.00	1.25	2.50	2.50
242	Iron, pentacarbonyl- T3	13463-40-6	56.00	4.00	1.00	3.75	3.00	1.25	2.50	2.50
243	Propionitrile-T3*	107-12-0	220.00	3.00	1.00	3.75	3.00	1.25	2.50	2.50
244	Chloromethyl methyl ether E3	107-30-2	300.00	3.00	2.00	2.50	3.00	1.25	2.50	2.50
245	Phenyltrichlorosilane-T3*	98-13-5	89.00	4.00	2.00	2.50	2.00	2.50	2.50	2.50
246	Vinyl acetate monomer-E3*	108-05-4	2335.00	2.00	2.00	2.50	3.00	1.25	2.50	2.50
247	Vinyltrichlorosilane-R*	75-94-5	68.00	4.00	2.00	2.50	3.00	1.25	2.50	2.50
248	Trichlorosilane-E3*	10025-78-2	150.00	3.00	2.00	2.50	4.00	0.00	2.50	2.50
249	Isoprene-T3*	78-79-5	150.00	3.00	2.00	2.50	4.00	0.00	2.50	2.50
250	Dimethyldichlorosilane T3	75-78-5	150.00	3.00	2.00	2.50	3.00	1.25	2.50	2.50
251	Nickel Carbonyl-T3*	13463-39-3	10.00	5.00	3.00	1.25	3.00	1.25	2.50	2.50
252	Tetramethylenedisulfotetramine MIN	126-33-0	3800.00	2.00	0.00	5.00	1.00	3.75	4.38	2.50
253	Thiophanate methyl MIN	23564-05-8	10000.00	2.00	0.00	5.00	1.00	3.75	4.38	1.00
254	guanidine hydrochloride R MIN	50-01-1	2000.00	2.00	0.00	5.00	1.00	3.75	4.38	1.00
255	Methylene bisphenyl isocyanate R as Resin	101-68-8	9400.00	2.00	1.00	3.75	1.00	3.75	3.75	1.00
256	p-Dichlorobenzene MIN	106-46-7	2000.00	2.00	0.00	5.00	2.00	2.50	3.75	1.00
257	Propylene oxide	75-56-9	1246.00	2.00	2.00	2.50	4.00	0.00	1.25	2.50
258	n-Butyl mercaptan IPR	109-79-5	399.00	3.00	0.00	5.00	3.00	1.25	3.13	2.50
259	1,2,3-Trichloropropane	96-18-4	149.00	3.00	1.00	3.75	2.00	2.50	3.13	2.50
260	Diisopropylamine R MIN	108-18-9	10000.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
261	2-Pentanone	107-87-9	6500.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
262	Isophorone	78-59-1	1390.00	2.00	1.00	3.75	2.00	2.50	3.13	2.50
263	Hydrazine R	302-01-2	91.00	4.00	3.00	1.25	4.00	0.00	0.63	2.50
264	Isopropyl acetate R MIN	108-21-4	20000.00	1.00	0.00	5.00	3.00	1.25	3.13	2.50
265	n-Propyl acetate R MIN	109-60-4	20000.00	1.00	0.00	5.00	3.00	1.25	3.13	2.50
266	Toluene-2,4-diisocyanate R MIN	584-84-9	16000.00	1.00	2.00	2.50	1.00	3.75	3.13	2.50
267	Aldrin	309-00-2	15.00	4.00	0.00	5.00	0.00	5.00	5.00	1.00
268	DDT	50-29-3	300.00	3.00	0.00	5.00	0.00	5.00	5.00	1.00
269	Morpholine R	110-91-8	500.00	3.00	1.00	3.75	3.00	1.25	2.50	1.00

Rank	Chemical and Toxicity Data Source	Toxic (Operational) Hazard Score	DWCP Data				Probability Section		Total Score
	Chemical Dermal Toxicity: LD50 Dermal Rat>Rabbit>Guinea Pig>Mouse>LD50 Subcutaneous>LD50 Intraperitoneal>LDLo Dermal Coding: M = mouse, R = rabbit, GP = guinea pig, MIN-LD value reported is the minimum, Intraperitoneal = IPR, Subcutaneous = SUB		# of Countries Producing	Production Score	# of Global Distribution Sites	Distribution Score	Relative Probability Score	Threat Scores	
225	Monomethyl aniline LDLo GP	8.25	6.00	0.00	17.00	3.00	3.00	0.00	11.25
226	1,2-dimethylimidazole LDLo M IPR	7.75	5.00	0.00	11.00	3.00	3.00	0.50	11.25
227	Diacetone alcohol R	7.25	11.00	1.00	30.00	3.00	4.00	0.00	11.25
228	Methyl (n-amyl) ketone R	7.25	11.00	1.00	20.00	3.00	4.00	0.00	11.25
229	Chloropicrin MIN	8.63	3.00	0.00	7.00	2.00	2.00	0.50	11.13
230	Endrin R	10.00	1.00	0.00	1.00	1.00	1.00	0.00	11.00
231	EPN R	10.00	2.00	0.00	4.00	1.00	1.00	0.00	11.00
232	Thallium sulfate	9.00	4.00	0.00	8.00	2.00	2.00	0.00	11.00
233	p-Anisidine	8.00	5.00	0.00	19.00	3.00	3.00	0.00	11.00
234	Warfarin	8.00	9.00	0.00	14.00	3.00	3.00	0.00	11.00
235	Ethyl silicate	7.00	10.00	1.00	39.00	3.00	4.00	0.00	11.00
236	Carbon disulfide R	7.00	16.00	1.00	45.00	3.00	4.00	0.00	11.00
237	Lithium IPR M	6.50	11.00	1.00	23.00	3.00	4.00	0.50	11.00
238	Cumene	6.00	20.00	2.00	39.00	3.00	5.00	0.00	11.00
239	Cyclohexylamine T3	8.00	8.00	0.00	32.00	3.00	3.00	0.00	11.00
240	Triethanolamine-T3*	9.00	6.00	0.00	6.00	2.00	2.00	0.00	11.00
241	Allylamine *T3	9.00	5.00	0.00	9.00	2.00	2.00	0.00	11.00
242	Iron, pentacarbonyl- T3	9.00	1.00	0.00	8.00	2.00	2.00	0.00	11.00
243	Propionitrile-T3*	8.00	3.00	0.00	14.00	3.00	3.00	0.00	11.00
244	Chloromethyl methyl ether E3	8.00	8.00	0.00	11.00	3.00	3.00	0.00	11.00
245	Phenyltrichlorosilane-T3*	9.00	1.00	0.00	9.00	2.00	2.00	0.00	11.00
246	Vinyl acetate monomer-E3*	7.00	4.00	0.00	53.00	4.00	4.00	0.00	11.00
247	Vinyltrichlorosilane-R*	9.00	3.00	0.00	8.00	2.00	2.00	0.00	11.00
248	Trichlorosilane-E3*	8.00	4.00	0.00	15.00	3.00	3.00	0.00	11.00
249	Isoprene-T3*	8.00	6.00	0.00	17.00	3.00	3.00	0.00	11.00
250	Dimethyldichlorosilane T3	8.00	4.00	0.00	20.00	3.00	3.00	0.00	11.00
251	Nickel Carbonyl-T3*	10.00	1.00	0.00	2.00	1.00	1.00	0.00	11.00
252	Tetramethylenedisulfotetramine MIN	8.88	5.00	0.00	10.00	2.00	2.00	0.00	10.88
253	Thiophanate methyl MIN	7.38	8.00	0.00	30.00	3.00	3.00	0.50	10.88
254	guanidine hydrochloride R MIN	7.38	7.00	0.00	12.00	3.00	3.00	0.50	10.88
255	Methylene bisphenyl isocyanate R as Resin	6.75	12.00	1.00	25.00	3.00	4.00	0.00	10.75
256	p-Dichlorobenzene MIN	6.75	10.00	1.00	38.00	3.00	4.00	0.00	10.75
257	Propylene oxide	5.75	16.00	1.00	54.00	4.00	5.00	0.00	10.75
258	n-Butyl mercaptan IPR	8.63	4.00	0.00	6.00	2.00	2.00	0.00	10.63
259	1,2,3-Trichloropropane	8.63	6.00	0.00	10.00	2.00	2.00	0.00	10.63
260	Diisopropylamine R MIN	7.63	6.00	0.00	18.00	3.00	3.00	0.00	10.63
261	2-Pentanone	7.63	8.00	0.00	13.00	3.00	3.00	0.00	10.63
262	Isophorone	7.63	7.00	0.00	13.00	3.00	3.00	0.00	10.63
263	Hydrazine R	7.13	9.00	0.00	12.00	3.00	3.00	0.50	10.63
264	Isopropyl acetate R MIN	6.63	14.00	1.00	41.00	3.00	4.00	0.00	10.63
265	n-Propyl acetate R MIN	6.63	12.00	1.00	31.00	3.00	4.00	0.00	10.63
266	Toluene-2,4-diisocyanate R MIN	6.63	12.00	1.00	20.00	3.00	4.00	0.00	10.63
267	Aldrin	10.00	0.00	0.00	0.00	0.00	0.00	0.50	10.50
268	DDT	9.00	2.00	0.00	3.00	1.00	1.00	0.50	10.50
269	Morpholine R	6.50	12.00	1.00	32.00	3.00	4.00	0.00	10.50

Rank	Chemical and Toxicity Data Source	CAS Number	Dermal Toxicity Value	Dermal Toxicity Score	Reactivity Number	Reactivity Score	Flammability Number	Flammability Score	Stability Score	Physical State
	Chemical Dermal Toxicity: LD50 Dermal Rat>Rabbit>Guinea Pig>Mouse>LD50 Subcutaneous>LD50 Intraperitoneal>LDLo Dermal Coding: M = mouse, R = rabbit, GP = guinea pig, MIN-LD value reported is the minimum, Intraperitoneal = IPR, Subcutaneous = SUB		in mg/kg (for values reported in ul/kg, the values were converted to mg/kg based on the density of the chemical at STP)							
270	Acrylamide	79-06-1	400.00	3.00	2.00	2.50	2.00	2.50	2.50	1.00
271	Aluminum chloride, anydrous *T3	7446-70-0	2000.00	2.00	2.00	2.50	0.00	5.00	1.00	2.50
272	Vinyl methyl ether-R*	107-25-5	8000.00	2.00	2.00	2.50	4.00	0.00	5.00	2.50
273	Trinitrophenol-T3*	88-89-1	60.00	4.00	4.00	0.00	1.00	3.75	1.00	2.50
274	Halothane IPR GP	151-67-7	1970.00	2.00	1.00	3.75	0.00	5.00	4.38	2.50
275	Crotonaldehyde	4170-30-3	26.00	4.00	2.00	2.50	3.00	1.25	1.88	2.50
276	Triphenyl phosphate R MIN	115-86-6	7900.00	2.00	0.00	5.00	1.00	3.75	4.38	1.00
277	Ammonium sulfamate	7773-06-0	5000.00	2.00	0.00	5.00	1.00	3.75	4.38	1.00
278	Methyl acrylate R	96-33-3	1243.00	2.00	2.00	2.50	3.00	1.25	1.88	2.50
279	Cyclopentadiene	542-92-7	430.00	3.00	0.00	5.00	2.00	2.50	3.75	2.50
280	Chloroacetaldehyde	107-20-0	267.00	3.00	2.00	2.50	0.00	5.00	3.75	2.50
281	Allyl glycidyl ether	106-92-3	2550.00	2.00	0.00	5.00	2.00	2.50	3.75	2.50
282	Dibutyl phosphate R based on monobutyl ester	107-66-4	2000.00	2.00	0.00	5.00	2.00	2.50	3.75	2.50
283	Trypan blue SUB M	72-57-1	267.00	3.00	0.00	5.00	2.00	2.50	3.75	1.00
284	Diisobutyl ketoneR	108-83-8	16120.00	1.00	0.00	5.00	2.00	2.50	3.75	2.50
285	2-Ethoxyethyl acetate	111-15-9	10500.00	1.00	0.00	5.00	2.00	2.50	3.75	2.50
286	Dicofol R	115-32-2	1870.00	2.00	1.00	3.75	1.00	3.75	3.75	1.00
287	p-Nitroaniline GP	100-01-6	500.00	3.00	2.00	2.50	1.00	3.75	3.13	1.00
288	Thioglycol	60-24-2	23694.00	1.00	1.00	3.75	2.00	2.50	3.13	2.50
289	Phosphorus pentasulfide	1314-80-3	3160.00	2.00	2.00	2.50	1.00	3.75	3.13	1.00
290	Rotenone MIN	83-79-4	940.00	3.00	0.00	5.00	0.00	5.00	5.00	1.00
291	Dinitrocresol	534-52-1	200.00	3.00	0.00	5.00	0.00	5.00	5.00	1.00
292	Heptachlor	76-44-8	119.00	3.00	0.00	5.00	0.00	5.00	5.00	1.00
293	Ferbam IPR	14484-64-1	2700.00	2.00	0.00	5.00	0.00	5.00	5.00	1.00
294	Hexachloroethane R	67-72-1	32000.00	1.00	0.00	5.00	0.00	5.00	5.00	1.00
295	1,3-Dichloro 5,5-dimethylhydantoin R MIN	118-52-5	20000.00	1.00	0.00	5.00	0.00	5.00	5.00	1.00
296	Methyl formate MIN	107-31-3	5000.00	2.00	0.00	5.00	4.00	0.00	2.50	2.50
297	tert-Butyl acetate R MIN	540-88-5	2000.00	2.00	0.00	5.00	4.00	0.00	2.50	2.50
298	Isopropyl ether R	108-20-3	20000.00	1.00	1.00	3.75	3.00	1.25	2.50	2.50
299	Methylal	109-87-5	16000.00	1.00	1.00	3.75	3.00	1.25	2.50	2.50
300	p-Nitrochlorobenzene	100-00-5	16000.00	1.00	3.00	1.25	1.00	3.75	2.50	1.00
301	Methyl chloroformate-T3*	79-22-1	1750.00	2.00	0.00	5.00	3.00	1.25	2.50	2.50
302	Isobutyronitrile-E3*	78-82-0	200.00	3.00	0.00	5.00	3.00	1.25	2.50	2.50
303	Triethyl phosphite-T3*	122-52-1	2800.00	2.00	0.00	5.00	2.00	2.50	2.50	2.50
304	Methylphenyldichlorosilane-T3*	149-74-6	120.00	3.00	0.00	5.00	2.00	2.50	2.50	2.50
305	1-Chloropropylene R	590-21-6	22.00	4.00	1.00	3.75	4.00	0.00	2.50	2.50
306	Arsenic trichloride T3	7784-34-1	80.00	4.00	1.00	3.75	0.00	5.00	2.50	2.50
307	Diethyl S-[2-(diethylamino)ethyl]phosphorothiolate o,o- T3	78-53-5	1.50	5.00	1.00	3.75	2.00	2.50	2.50	2.50
308	Trimethyl phosphite-T3*	121-45-9	2600.00	2.00	1.00	3.75	3.00	1.25	2.50	2.50
309	Diphenyldichlorosilane	80-10-4	100.00	4.00	2.00	2.50	1.00	3.75	2.50	2.50
310	Iodine pentafluoride R	7783-66-6	129.00	3.00	2.00	2.50	0.00	5.00	2.50	2.50
311	Vinylidene chloride, inhibited-T3*	75-35-4	2426.00	2.00	2.00	2.50	4.00	0.00	2.50	2.50
312	Xylidine	1300-73-8	2000.00	2.00	0.00	5.00	1.00	3.75	4.38	2.50

Rank	Chemical and Toxicity Data Source	Toxic (Operational) Hazard Score	DWCP Data				Probability Section		Total Score
	Chemical Dermal Toxicity: LD50 Dermal Rat>Rabbit>Guinea Pig>Mouse>LD50 Subcutaneous>LD50 Intraperitoneal>LDLo Dermal Coding: M = mouse, R = rabbit, GP = guinea pig, MIN-LD value reported is the minimum, Intraperitoneal = IPR, Subcutaneous = SUB		# of Countries Producing	Production Score	# of Global Distribution Sites	Distribution Score	Relative Probability Score	Threat Scores	
270	Acrylamide	6.50	14.00	1.00	48.00	3.00	4.00	0.00	10.50
271	Aluminum chloride, anydrous *T3	5.50	10.00	1.00	99.00	4.00	5.00	0.00	10.50
272	Vinyl methyl ether-R*	9.50	1.00	0.00	3.00	1.00	1.00	0.00	10.50
273	Trinitrophenol-T3*	7.50	8.00	0.00	18.00	3.00	3.00	0.00	10.50
274	Halothane IPR GP	8.88	3.00	0.00	4.00	1.00	1.00	0.50	10.38
275	Crotonaldehyde	8.38	6.00	0.00	9.00	2.00	2.00	0.00	10.38
276	Triphenyl phosphate R MIN	7.38	5.00	0.00	21.00	3.00	3.00	0.00	10.38
277	Ammonium sulfamate	7.38	8.00	0.00	14.00	3.00	3.00	0.00	10.38
278	Methyl acrylate R	6.38	16.00	1.00	46.00	3.00	4.00	0.00	10.38
279	Cyclopentadiene	9.25	2.00	0.00	2.00	1.00	1.00	0.00	10.25
280	Chloroacetaldehyde	9.25	4.00	0.00	5.00	1.00	1.00	0.00	10.25
281	Allyl glycidyl ether	8.25	6.00	0.00	8.00	2.00	2.00	0.00	10.25
282	Dibutyl phosphate R based on monobutyl ester	8.25	6.00	0.00	8.00	2.00	2.00	0.00	10.25
283	Trypan blue SUB M	7.75	6.00	0.00	10.00	2.00	2.00	0.50	10.25
284	Diisobutyl ketoneR	7.25	8.00	0.00	13.00	3.00	3.00	0.00	10.25
285	2-Ethoxyethyl acetate	7.25	8.00	0.00	17.00	3.00	3.00	0.00	10.25
286	Dicofol R	6.75	8.00	0.00	18.00	3.00	3.00	0.50	10.25
287	p-Nitroaniline GP	7.13	5.00	0.00	47.00	3.00	3.00	0.00	10.13
288	Thioglycol	6.63	6.00	0.00	17.00	3.00	3.00	0.50	10.13
289	Phosphorus pentasulfide	6.13	12.00	1.00	28.00	3.00	4.00	0.00	10.13
290	Rotenone MIN	9.00	2.00	0.00	2.00	1.00	1.00	0.00	10.00
291	Dinitrocresol	9.00	2.00	0.00	3.00	1.00	1.00	0.00	10.00
292	Heptachlor	9.00	1.00	0.00	1.00	1.00	1.00	0.00	10.00
293	Ferbam IPR	8.00	6.00	0.00	8.00	2.00	2.00	0.00	10.00
294	Hexachloroethane R	7.00	3.00	0.00	15.00	3.00	3.00	0.00	10.00
295	1,3-Dichloro 5,5-dimethylhydantoin R MIN	7.00	3.00	0.00	16.00	3.00	3.00	0.00	10.00
296	Methyl formate MIN	7.00	8.00	0.00	16.00	3.00	3.00	0.00	10.00
297	tert-Butyl acetate R MIN	7.00	6.00	0.00	17.00	3.00	3.00	0.00	10.00
298	Isopropyl ether R	6.00	15.00	1.00	24.00	3.00	4.00	0.00	10.00
299	Methylal	6.00	10.00	1.00	13.00	3.00	4.00	0.00	10.00
300	p-Nitrochlorobenzene	4.50	6.00	0.00	25.00	3.00	3.00	2.50	10.00
301	Methyl chloroformate-T3*	7.00	2.00	0.00	23.00	3.00	3.00	0.00	10.00
302	Isobutyronitrile-E3*	8.00	3.00	0.00	6.00	2.00	2.00	0.00	10.00
303	Triethyl phosphite-T3*	7.00	6.00	0.00	13.00	3.00	3.00	0.00	10.00
304	Methylphenyldichlorosilane-T3*	8.00	1.00	0.00	6.00	2.00	2.00	0.00	10.00
305	1-Chloropropylene R	9.00	2.00	0.00	2.00	1.00	1.00	0.00	10.00
306	Arsenic trichloride T3	9.00	1.00	0.00	5.00	1.00	1.00	0.00	10.00
307	Diethyl S-[2-(diethylamino)ethyl]phosphorothiolate o,o- T3	10.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
308	Trimethyl phosphite-T3*	7.00	4.00	0.00	18.00	3.00	3.00	0.00	10.00
309	Diphenyldichlorosilane	9.00	2.00	0.00	5.00	1.00	1.00	0.00	10.00
310	Iodine pentafluoride R	8.00	2.00	0.00	8.00	2.00	2.00	0.00	10.00
311	Vinylidene chloride, inhibited-T3*	7.00	2.00	0.00	12.00	3.00	3.00	0.00	10.00
312	Xylidine	8.88	4.00	0.00	4.00	1.00	1.00	0.00	9.88

Rank	Chemical and Toxicity Data Source	CAS Number	Dermal Toxicity Value	Dermal Toxicity Score	Reactivity Number	Reactivity Score	Flammability Number	Flammability Score	Stability Score	Physical State
	Chemical Dermal Toxicity: LD50 Dermal Rat>Rabbit>Guinea Pig>Mouse>LD50 Subcutaneous>LD50 Intraperitoneal>LDLo Dermal Coding: M = mouse, R = rabbit, GP = guinea pig, MIN-LD value reported is the minimum, Intraperitoneal = IPR, Subcutaneous = SUB		in mg/kg (for values reported in ul/kg, the values were converted to mg/kg based on the density of the chemical at STP)							
313	Pyrethrum	8003-34-7	1350.00	2.00	0.00	5.00	1.00	3.75	4.38	2.50
314	Hexachlorobenzene IPR MIN	118-74-1	500.00	3.00	1.00	3.75	0.00	5.00	4.38	1.00
315	Azinphosmethyl NITF MIN	86-50-0	2000.00	2.00	0.00	5.00	1.00	3.75	4.38	1.00
316	1,1-Dimethylhydrazine	57-14-7	301.00	3.00	1.00	3.75	4.00	0.00	1.88	2.50
317	Biphenyl F24	92-52-4	11904.00	1.00	0.00	5.00	1.00	3.75	4.38	1.00
318	Isoflurane IPR	26675-46-7	14400.00	1.00	1.00	3.75	1.00	3.75	3.75	2.50
319	Dipropylene glycol methyl ether R	34590-94-8	10000.00	2.00	0.00	5.00	2.00	2.50	3.75	1.00
320	Methyl Cellosolve (r) acetate R	110-49-6	5250.00	2.00	0.00	5.00	2.00	2.50	3.75	1.00
321	Acrolein	107-02-8	200.00	3.00	3.00	1.25	3.00	1.25	1.25	2.50
322	Acetaldehyde	75-07-0	3540.00	2.00	2.00	2.50	4.00	0.00	1.25	2.50
323	Sodium borohydride SUB	16940-66-2	177.00	3.00	3.00	1.25	3.00	1.25	1.25	1.00
324	2-Hexanone	591-78-6	914.00	3.00	0.00	5.00	3.00	1.25	3.13	2.50
325	Turpentine	8006-64-2	5010.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
326	Glycidol R	556-52-5	1980.00	2.00	2.00	2.50	1.00	3.75	3.13	2.50
327	Phenyl glycidyl ether R	122-60-1	1663.80	2.00	0.00	5.00	3.00	1.25	3.13	2.50
328	Ethyl formate R MIN	109-94-4	20000.00	1.00	0.00	5.00	3.00	1.25	3.13	2.50
329	Cyclohexene	110-83-8	16196.00	1.00	0.00	5.00	3.00	1.25	3.13	2.50
330	Propylene dichloride R	78-87-5	10132.50	1.00	0.00	5.00	3.00	1.25	3.13	2.50
331	Nitromethane IPR M	75-52-5	110.00	3.00	4.00	0.00	3.00	1.25	0.63	2.50
332	Azinphos-ethyl	2642-71-9	250.00	3.00	0.00	5.00	0.00	5.00	5.00	1.00
333	Dieldrin R	60-57-1	250.00	3.00	0.00	5.00	0.00	5.00	5.00	1.00
334	Antimony oxide MIN	1309-64-4	2000.00	2.00	0.00	5.00	0.00	5.00	5.00	1.00
335	Toxaphene R	8001-35-2	1025.00	2.00	0.00	5.00	0.00	5.00	5.00	1.00
336	TNT	118-96-7	500.00	3.00	3.00	1.25	4.00	0.00	1.00	2.50
337	Chlorinated camphene	8001-35-2	600.00	3.00	0.00	5.00	1.00	3.75	4.38	1.00
338	Tetranitromethane IIPR M	509-14-8	53.00	4.00	1.00	3.75	4.00	0.00	1.88	2.50
339	Methyl hydrazine	60-34-4	183.00	3.00	2.00	2.50	3.00	1.25	1.88	2.50
340	Methyl methacrylate R	80-62-6	35500.00	1.00	2.00	2.50	3.00	1.25	1.88	2.50
341	Chlordane	57-74-9	690.00	3.00	0.00	5.00	2.00	2.50	3.75	2.50
342	Methylcyclohexanol SUB	25639-42-3	2900.00	2.00	0.00	5.00	2.00	2.50	3.75	2.50
343	o-Methylcyclohexanone R	583-60-8	1646.10	2.00	0.00	5.00	2.00	2.50	3.75	2.50
344	Perchloromethyl mercaptan R	594-42-3	1410.00	2.00	2.00	2.50	0.00	5.00	3.75	2.50
345	p-tert-Butyltoluene R	98-51-1	16934.00	1.00	0.00	5.00	2.00	2.50	3.75	2.50
346	o-Chlorobenzylidene malononitrile IPR	2698-41-1	48.00	4.00	0.00	5.00	3.00	1.25	3.13	1.00
347	Methoxychlor	72-43-5	6000.00	2.00	0.00	5.00	0.00	5.00	5.00	1.00
348	Difethialone R	104653-34-1	2000.00	2.00	0.00	5.00	0.00	5.00	5.00	1.00
349	2,4,5-T	93-76-5	1535.00	2.00	0.00	5.00	0.00	5.00	5.00	1.00
350	ANTU	86-88-4	1300.00	2.00	0.00	5.00	0.00	5.00	5.00	1.00
351	Dimethyl 1,2-dibromo 2,2-dichlorethyl phosphate R	300-76-5	1100.00	2.00	0.00	5.00	0.00	5.00	5.00	1.00
352	Mesityl oxide R	141-79-7	5150.00	2.00	1.00	3.75	3.00	1.25	2.50	2.50
353	Furan T3	110-00-9	150.00	3.00	1.00	3.75	4.00	0.00	2.50	2.50
354	Chloromethyl ether E3	542-88-1	150.00	3.00	1.00	3.75	3.00	1.25	2.50	2.50
355	Antimony Pentafluoride T3	7783-70-2	270.00	3.00	1.00	3.75	0.00	5.00	2.50	2.50
356	Crotonaldehyde, (E)- T3	123-73-9	380.00	3.00	2.00	2.50	3.00	1.25	2.50	2.50
357	Amyltrichlorosilane R	107-72-2	780.00	3.00	2.00	2.50	2.00	2.50	2.50	2.50

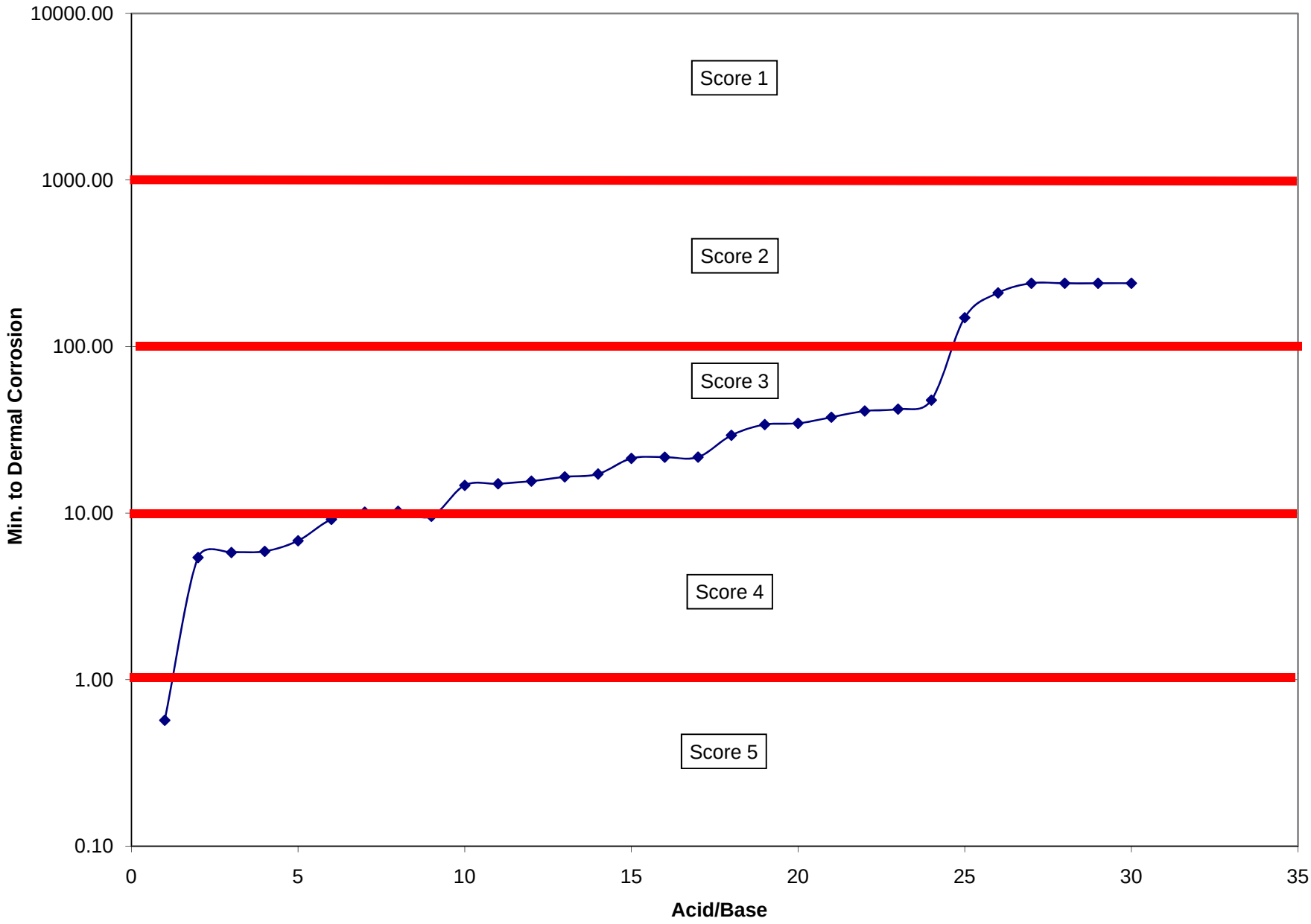
Rank	Chemical and Toxicity Data Source	Toxic (Operational) Hazard Score	DWCP Data				Probability Section		Total Score
	Chemical Dermal Toxicity: LD50 Dermal Rat>Rabbit>Guinea Pig>Mouse>LD50 Subcutaneous>LD50 Intraperitoneal>LDLo Dermal Coding: M = mouse, R = rabbit, GP = guinea pig, MIN-LD value reported is the minimum, Intraperitoneal = IPR, Subcutaneous = SUB		# of Countries Producing	Production Score	# of Global Distribution Sites	Distribution Score	Relative Probability Score	Threat Scores	
313	Pyrethrum	8.88	4.00	0.00	4.00	1.00	1.00	0.00	9.88
314	Hexachlorobenzene IPR MIN	8.38	1.00	0.00	2.00	1.00	1.00	0.50	9.88
315	Azinphosmethyl NITF MIN	7.38	5.00	0.00	7.00	2.00	2.00	0.50	9.88
316	1,1-Dimethylhydrazine	7.38	7.00	0.00	9.00	2.00	2.00	0.50	9.88
317	Biphenyl F24	6.38	7.00	0.00	18.00	3.00	3.00	0.50	9.88
318	Isoflurane IPR	7.25	2.00	0.00	8.00	2.00	2.00	0.50	9.75
319	Dipropylene glycol methyl ether R	6.75	7.00	0.00	35.00	3.00	3.00	0.00	9.75
320	Methyl Cellosolve (r) acetate R	6.75	6.00	0.00	12.00	3.00	3.00	0.00	9.75
321	Acrolein	6.75	7.00	0.00	12.00	3.00	3.00	0.00	9.75
322	Acetaldehyde	5.75	15.00	1.00	49.00	3.00	4.00	0.00	9.75
323	Sodium borohydride SUB	5.25	13.00	1.00	34.00	3.00	4.00	0.50	9.75
324	2-Hexanone	8.63	2.00	0.00	3.00	1.00	1.00	0.00	9.63
325	Turpentine	7.63	6.00	0.00	9.00	2.00	2.00	0.00	9.63
326	Glycidol R	7.63	4.00	0.00	6.00	2.00	2.00	0.00	9.63
327	Phenyl glycidyl ether R	7.63	7.00	0.00	10.00	2.00	2.00	0.00	9.63
328	Ethyl formate R MIN	6.63	6.00	0.00	16.00	3.00	3.00	0.00	9.63
329	Cyclohexene	6.63	9.00	0.00	14.00	3.00	3.00	0.00	9.63
330	Propylene dichloride R	6.63	9.00	0.00	16.00	3.00	3.00	0.00	9.63
331	Nitromethane IPR M	6.13	7.00	0.00	20.00	3.00	3.00	0.50	9.63
332	Azinphos-ethyl	9.00	0.00	0.00	0.00	0.00	0.00	0.50	9.50
333	Dieldrin R	9.00	0.00	0.00	0.00	0.00	0.00	0.50	9.50
334	Antimony oxide MIN	8.00	2.00	0.00	4.00	1.00	1.00	0.50	9.50
335	Toxaphene R	8.00	1.00	0.00	1.00	1.00	1.00	0.50	9.50
336	TNT	6.50	3.00	0.00	15.00	3.00	3.00	0.00	9.50
337	Chlorinated camphene	8.38	1.00	0.00	1.00	1.00	1.00	0.00	9.38
338	Tetranitromethane IIPR M	8.38	1.00	0.00	1.00	1.00	1.00	0.00	9.38
339	Methyl hydrazine	7.38	4.00	0.00	6.00	2.00	2.00	0.00	9.38
340	Methyl methacrylate R	5.38	17.00	1.00	48.00	3.00	4.00	0.00	9.38
341	Chlordane	9.25	0.00	0.00	0.00	0.00	0.00	0.00	9.25
342	Methylcyclohexanol SUB	8.25	1.00	0.00	1.00	1.00	1.00	0.00	9.25
343	o-Methylcyclohexanone R	8.25	4.00	0.00	5.00	1.00	1.00	0.00	9.25
344	Perchloromethyl mercaptan R	8.25	3.00	0.00	5.00	1.00	1.00	0.00	9.25
345	p-tert-Butyltoluene R	7.25	4.00	0.00	6.00	2.00	2.00	0.00	9.25
346	o-Chlorobenzylidene malononitrile IPR	8.13	1.00	0.00	1.00	1.00	1.00	0.00	9.13
347	Methoxychlor	8.00	1.00	0.00	1.00	1.00	1.00	0.00	9.00
348	Difethialone R	8.00	1.00	0.00	1.00	1.00	1.00	0.00	9.00
349	2,4,5-T	8.00	1.00	0.00	1.00	1.00	1.00	0.00	9.00
350	ANTU	8.00	3.00	0.00	3.00	1.00	1.00	0.00	9.00
351	Dimethyl 1,2-dibromo 2,2-dichlorethyl phosphate R	8.00	3.00	0.00	4.00	1.00	1.00	0.00	9.00
352	Mesityl oxide R	7.00	5.00	0.00	6.00	2.00	2.00	0.00	9.00
353	Furan T3	8.00	3.00	0.00	5.00	1.00	1.00	0.00	9.00
354	Chloromethyl ether E3	8.00	1.00	0.00	1.00	1.00	1.00	0.00	9.00
355	Antimony Pentafluoride T3	8.00	3.00	0.00	4.00	1.00	1.00	0.00	9.00
356	Crotonaldehyde, (E)- T3	8.00	1.00	0.00	2.00	1.00	1.00	0.00	9.00
357	Amyltrichlorosilane R	8.00	1.00	0.00	2.00	1.00	1.00	0.00	9.00

Rank	Chemical and Toxicity Data Source	CAS Number	Dermal Toxicity Value	Dermal Toxicity Score	Reactivity Number	Reactivity Score	Flammability Number	Flammability Score	Stability Score	Physical State
	Chemical Dermal Toxicity: LD50 Dermal Rat>Rabbit>Guinea Pig>Mouse>LD50 Subcutaneous>LD50 Intraperitoneal>LDLo Dermal Coding: M = mouse, R = rabbit, GP = guinea pig, MIN-LD value reported is the minimum, Intraperitoneal = IPR, Subcutaneous = SUB		in mg/kg (for values reported in ul/kg, the values were converted to mg/kg based on the density of the chemical at STP)							
358	Ethyltrichlorosilane T3	115-21-9	150.00	3.00	2.00	2.50	2.00	2.50	2.50	2.50
359	Trinitrobenzenesulfonic acid	2508-19-2	100.00	4.00	2.00	2.50	3.00	1.25	2.50	2.50
360	Coniline (R-2-ethylpiperidine) (piperidine)	22160-08-3	320.00	3.00	0.00	5.00	1.00	3.75	4.38	1.00
361	Tetramethyl succinonitrile SUB GP	3333-52-6	23.00	4.00	0.00	5.00	2.00	2.50	3.75	1.00
362	Ethyleneimine GP	151-56-4	14.00	4.00	3.00	1.25	3.00	1.25	1.25	2.50
363	Nitroethane IPR M	79-24-3	310.00	3.00	3.00	1.25	3.00	1.25	1.25	2.50
364	Chlorodiphenyl (42% chlorine) IPR MIN	53469-21-9	1000.00	3.00	2.00	2.50	1.00	3.75	3.13	2.50
365	1,1-Dichloroethane	75-34-3	2800.00	2.00	0.00	5.00	3.00	1.25	3.13	2.50
366	Tetraethyl lead	78-00-2	3391.00	2.00	2.00	2.50	2.00	2.50	2.50	2.50
367	Trinitrochlorobenzene-T3*	88-88-0	40.00	4.00	3.00	1.25	3.00	1.25	1.00	2.50
368	Ammonium perchlorate T3	7790-98-9	1600.00	2.00	4.00	0.00	0.00	5.00	1.00	2.50
369	1-Nitropropane IPR	108-03-2	250.00	3.00	2.00	2.50	3.00	1.25	1.88	2.50
370	Ethyl mercaptan IPR	75-08-1	226.00	3.00	1.00	3.75	4.00	0.00	1.88	2.50
371	Diketene R	674-82-8	2518.70	2.00	2.00	2.50	3.00	1.25	1.88	2.50
372	Ethyl butyl ketone MIN	106-35-4	20000.00	1.00	0.00	5.00	2.00	2.50	3.75	2.50
373	5-Methyl 3-heptanone	541-85-5	16000.00	1.00	0.00	5.00	2.00	2.50	3.75	2.50
374	Ronnel	299-84-3	2000.00	2.00	0.00	5.00	0.00	5.00	5.00	1.00
375	Vinyl toluene (inhibited)	25013-15-4	4500.00	2.00	2.00	2.50	2.00	2.50	2.50	2.50
376	Ethylene glycol dinitrate	628-96-6	3800.00	2.00	0.00	5.00	4.00	0.00	2.50	2.50
377	Methyl thiocyanate-T3*	1556-64-9	2670.00	2.00	1.00	3.75	2.00	2.50	2.50	2.50
378	Methacrylonitrile-T3*	126-98-7	2080.00	2.00	2.00	2.50	3.00	1.25	2.50	2.50
379	Vinyl ethyl ether-T3*	109-92-2	20000.00	1.00	2.00	2.50	4.00	0.00	2.50	2.50
380	Tetramethyllead-T3*	75-74-1	3391.00	2.00	3.00	1.25	3.00	1.25	2.50	2.50
381	Diethyleneglycol dinitrate R	693-21-0	2000.00	2.00	4.00	0.00	4.00	0.00	2.50	2.50
382	Decaborane	17702-41-9	740.00	3.00	2.00	2.50	2.00	2.50	2.50	1.00
383	Aluminum phosphide *T3	20859-73-8	50000.00	1.00	2.00	2.50	4.00	0.00	1.00	2.50
384	Picrite	556-88-7	2000.00	2.00	4.00	0.00	0.00	5.00	1.00	2.50
385	Isopropyl glycidyl ether R	4016-14-2	9650.00	2.00	2.00	2.50	3.00	1.25	1.88	2.50
386	1,2-Dichloroethylene R	540-59-0	2800.00	2.00	2.00	2.50	3.00	1.25	1.88	2.50
387	Methyl isocyanate	624-83-9	2780.00	2.00	2.00	2.50	3.00	1.25	1.88	2.50
388	sec Hexyl acetate R MIN	108-84-9	20000.00	1.00	0.00	5.00	2.00	2.50	3.75	2.50
389	Diglycidyl ether R	2238-07-5	1500.00	2.00	4.00	0.00	2.00	2.50	1.25	2.50
390	Trinitrobenzene	99-35-4	2000.00	2.00	2.00	2.50	0.00	5.00	1.00	2.50
391	HMX T3	2691-41-0	5000.00	2.00	3.00	1.25	4.00	0.00	1.00	2.50
392	1-Chloro-1-nitropropane	600-25-9	5000.00	2.00	3.00	1.25	2.00	2.50	1.88	2.50
393	Propylene imine GP	75-55-8	34700.00	1.00	2.00	2.50	4.00	0.00	1.25	2.50
394	Magnesium phosphide- Rentokil MSDS*	12057-74-8	50000.00	1.00	2.00	2.50	4.00	0.00	1.00	2.50
395	Dinitrophenol, Dry or wet T3	25550-58-7 (51-28-5)	25000.00	1.00	4.00	0.00	4.00	0.00	1.00	2.50

Rank	Chemical and Toxicity Data Source	Toxic (Operational) Hazard Score	DWCP Data				Probability Section		Total Score
	Chemical Dermal Toxicity: LD50 Dermal Rat>Rabbit>Guinea Pig>Mouse>LD50 Subcutaneous>LD50 Intraperitoneal>LDLo Dermal Coding: M = mouse, R = rabbit, GP = guinea pig, MIN- LD value reported is the minimum, Intraperitoneal = IPR, Subcutaneous = SUB		# of Countries Producing	Production Score	# of Global Distribution Sites	Distribution Score	Relative Probability Score	Threat Scores	
358	Ethyltrichlorosilane T3	8.00	1.00	0.00	2.00	1.00	1.00	0.00	9.00
359	Trinitrobenzenesulfonic acid	9.00	0.00	0.00	0.00	0.00	0.00	0.00	9.00
360	Coniline (R-2-ethylpiperidine) (piperidine)	8.38	0.00	0.00	0.00	0.00	0.00	0.50	8.88
361	Tetramethyl succinonitrile SUB GP	8.75	0.00	0.00	0.00	0.00	0.00	0.00	8.75
362	Ethyleneimine GP	7.75	3.00	0.00	3.00	1.00	1.00	0.00	8.75
363	Nitroethane IPR M	6.75	3.00	0.00	8.00	2.00	2.00	0.00	8.75
364	Chlorodiphenyl (42% chlorine) IPR MIN	8.63	0.00	0.00	0.00	0.00	0.00	0.00	8.63
365	1,1-Dichloroethane	7.63	3.00	0.00	3.00	1.00	1.00	0.00	8.63
366	Tetraethyl lead	7.00	1.00	0.00	2.00	1.00	1.00	0.50	8.50
367	Trinitrochlorobenzene-T3*	7.50	1.00	0.00	1.00	1.00	1.00	0.00	8.50
368	Ammonium perchlorate T3	5.50	2.00	0.00	16.00	3.00	3.00	0.00	8.50
369	1-Nitropropane IPR	7.38	3.00	0.00	4.00	1.00	1.00	0.00	8.38
370	Ethyl mercaptan IPR	7.38	4.00	0.00	5.00	1.00	1.00	0.00	8.38
371	Diketene R	6.38	3.00	0.00	8.00	2.00	2.00	0.00	8.38
372	Ethyl butyl ketone MIN	7.25	2.00	0.00	4.00	1.00	1.00	0.00	8.25
373	5-Methyl 3-heptanone	7.25	2.00	0.00	3.00	1.00	1.00	0.00	8.25
374	Ronnel	8.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00
375	Vinyl toluene (inhibited)	7.00	1.00	0.00	3.00	1.00	1.00	0.00	8.00
376	Ethylene glycol dinitrate	7.00	3.00	0.00	3.00	1.00	1.00	0.00	8.00
377	Methyl thiocyanate-T3*	7.00	1.00	0.00	2.00	1.00	1.00	0.00	8.00
378	Methacrylonitrile-T3*	7.00	1.00	0.00	1.00	1.00	1.00	0.00	8.00
379	Vinyl ethyl ether-T3*	6.00	3.00	0.00	8.00	2.00	2.00	0.00	8.00
380	Tetramethyllead-T3*	7.00	2.00	0.00	2.00	1.00	1.00	0.00	8.00
381	Diethyleneglycol dinitrate R	7.00	2.00	0.00	4.00	1.00	1.00	0.00	8.00
382	Decaborane	6.50	2.00	0.00	1.00	1.00	1.00	0.00	7.50
383	Aluminum phosphide *T3	4.50	2.00	0.00	17.00	3.00	3.00	0.00	7.50
384	Picrite	5.50	5.00	0.00	8.00	2.00	2.00	0.00	7.50
385	Isopropyl glycidyl ether R	6.38	1.00	0.00	1.00	1.00	1.00	0.00	7.38
386	1,2-Dichloroethylene R	6.38	2.00	0.00	2.00	1.00	1.00	0.00	7.38
387	Methyl isocyanate	6.38	2.00	0.00	2.00	1.00	1.00	0.00	7.38
388	sec Hexyl acetate R MIN	7.25	0.00	0.00	0.00	0.00	0.00	0.00	7.25
389	Diglycidyl ether R	5.75	1.00	0.00	1.00	1.00	1.00	0.00	6.75
390	Trinitrobenzene	5.50	1.00	0.00	1.00	1.00	1.00	0.00	6.50
391	HMX T3	5.50	1.00	0.00	2.00	1.00	1.00	0.00	6.50
392	1-Chloro-1-nitropropane	6.38	2.00	0.00	0.00	0.00	0.00	0.00	6.38
393	Propylene imine GP	4.75	3.00	0.00	4.00	1.00	1.00	0.00	5.75
394	Magnesium phosphide- Rentokil MSDS*	4.50	2.00	0.00	5.00	1.00	1.00	0.00	5.50
395	Dinitrophenol, Dry or wet T3	4.50	0.00	0.00	0.00	0.00	0.00	0.00	4.50

EPA defines dermal corrosion as the production of irreversible damage to the skin; namely, visible necrosis through the epidermis and into the dermis, following the application of a test substance for up to 4 hours.

Compound Name	Concentration (weight %)	pH	Time Minutes	Score	Rank
Nitric acid	90.00	0.00	0.57	5	1
Ammonium hydroxide	10.00	12.37	5.41	4	2
Hydrochloric acid	35.00	0.00	5.8	4	3
Diethylamine	98.00	13.86	5.89	4	4
Potassium hydroxide	100	14.00	6.82	4	5
Bromoacetic acid	55.60	0.93	9.17	4	6
Thiophosphoryl chloride	98.00	5.81	10.13	3	7
Triphosphoryl chloride	98.00	5.80	10.25	3	8
Sulfuric acid	18	0.00	9.56	4	9
Sodium hydroxide	100	13.81	14.67	3	10
Phosphoric acid	85.00	0.00	15	3	11
Maleic acid	99.00	1.30	15.55	3	12
Aluminum chloride	100	2.92	16.5	3	13
Sodium metasilicate	20.00	13.28	17.17	3	14
Ferric chloride	98.00	3.00	21.3	3	15
1,2-Diaminopropane	99	12.06	21.67	3	16
Ethanolamine	99	11.82	21.68	3	17
Acetic acid	99	0.00	29.31	3	18
Diethylene triamine	99.00	12.01	34	3	19
Propionic acid	99	0.35	34.59	3	20
Dichloroacetic acid	3.10	0.98	37.63	3	21
Triethanolamine	60.00	11.02	41.03	3	22
Mercaptoacetic acid	15.10	1.60	42.09	3	23
Citric acid	20.00	1.28	47.65	3	24
Hexanoic acid	99.00	3.00	149	2	25
Dicyclohexylamine	99.00	9.57	210	2	26
Butylamine	40.00	12.96	240	2	27
Formic acid	33.90	0.62	240	2	28
Tributylamine	99	10.70	240	2	29
Trichlorotoluene	99.00	3.32	240	2	30


10000.00
1000.00
100.00
10.00
1.00
0.10
Min. to Dermal Corrosion
Score 1
Score 2
Score 3
Score 4
Score 5
0
5
10
15
20
25
30
35
Acid/Base

Critical Percutaneous Hazard List						
Rank	Chemical and Toxicity Data Source	CAS Number	Toxic (Operational) Hazard Score	Probability Section		Total Score
				Relative Probability Score	Threat Scores	
1	Ammonia (as ammonium hydroxide) SUB LDLo R	7664-41-7	13.38	10.00	5.00	28.38
2	Hydrogen chloride IPR Mouse	7647-01-0	13.38	10.00	0.50	23.88
3	Formaldehyde (Formalin solution-37% methanol) R	50-00-0	11.75	10.00	0.50	22.25
4	Sulfuric acid	7664-93-9	10.25	10.00	2.50	22.75
5	Nitric acid TDLo	7697-37-2	12.50	9.00	0.50	22.00
6	Hydrogen fluoride LDLo M	7664-39-3	12.38	7.00	2.50	21.88
7	Hydrogen bromide IPR	10035-10-6	14.00	5.00	0.00	19.00
8	Tetrafluoroboric acid IPR	16872-11-0	11.88	5.00	0.50	17.38
9	Methyl bromide SUB	74-83-9	12.38	4.00	0.50	16.88
10	Boron trifluoride R and as 40% HF	7637-07-2	12.38	4.00	0.00	16.38
11	Fluorotrichloromethane IPR Mouse	75-69-4	12.00	4.00	0.00	16.00
12	Hydrogen sulfide IIPR M	7783-06-4	11.50	4.00	0.50	16.00
13	OMPA	152-16-9	11.50	4.00	0.50	16.00
14	Tetrachloroethylene SUB M	127-18-4	11.50	4.00	0.00	15.50
15	Potassium cyanide SUB R	151-50-8	11.00	4.00	2.50	17.50
16	Cadmium SUB	7440-43-9	11.00	4.00	0.50	15.50
17	Mercury Tdlo, H, SUB	7439-97-6	10.50	4.00	5.00	19.50
18	Deltamethrin MIN	52918-63-5	10.50	4.00	0.50	15.00
19	Ethylamine **	75-04-7	10.50	4.00	0.00	14.50
20	Methylamine GP LDLo	74-89-5	10.50	4.00	0.00	14.50
21	Hexafluoroacetone **	684-16-2	11.50	3.00	0.00	14.50
22	Phosphine TDLo IPR	7803-51-2	11.25	3.00	0.50	14.75
23	Parathion *	56-38-2	10.63	3.00	0.50	14.13
24	Ethylene dibromide	106-93-4	10.50	3.00	0.00	13.50
25	Trimethylamine-**	75-50-3	10.50	3.00	0.00	13.50
26	Dichloroethyl ether R	111-44-4	10.25	3.00	0.00	13.25
27	Nitrogen trifluoride IPR	7783-54-2	10.25	3.00	0.00	13.25
28	Aldicarb	116-06-3	11.00	2.00	0.50	13.50

High Priority Percutaneous Hazard Chemicals						
Rank	Chemical and Toxicity Data Source	CAS Number	Toxic Hazard Score	Probability Section		Total Score
				Relative Probability Score	Threat Scores	
1	Ammonia (as ammonium hydroxide) SUB LDLo R	7664-41-7	13.38	10.00	5.00	28.38
2	Ethylene dibromide	106-93-4	10.50	3.00	0.00	13.50
3	Formaldehyde (Formalin solution-37% methanol) R	50-00-0	11.75	10.00	0.50	22.25
4	Nitric acid TDLo	7697-37-2	12.50	9.00	0.50	22.00
5	OMPA	152-16-9	11.50	4.00	0.50	16.00
6	Sulfuric acid	7664-93-9	10.25	10.00	2.50	22.75